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Clear Creek Integrated Restoration Project

Final Environmental Impact Statement

Volume 1: Chapters 1–7 and Appendix A, Maps

(See Volume 2 for Appendices B through L)

Moose Creek Ranger District, Nez Perce–Clearwater National Forest

Idaho County, Idaho

Final Environmental Impact Statement Clear

Creek Integrated Restoration Project

Moose Creek Ranger District
Nez Perce National Forest
Idaho County, Idaho

Lead Agency:	**USDA Forest Service**
Responsible Official:	**Cheryl Probert, Forest Supervisor** **Nez Perce–Clearwater National Forest** **903 3rd Street** **Kamiah, Idaho 83536**
For Information Contact:	**Joe Hudson, Moose Creek District Ranger** **831 Selway Road** **Kooskia, Idaho 83539** **208-926-4258**

Abstract: This Final Environmental Impact Statement (FEIS) documents the analysis of four alternatives (including a "no action" alternative) that were developed for the Clear Creek Integrated Restoration project. The project area comprises 43,731 acres of National Forest System lands within the Clear Creek drainage, located approximately 5 air miles southeast of Kooskia, Idaho. The Clear Creek watershed lies within the Selway–Middle Fork Clearwater Collaborative Forest Landscape Restoration Program (CFLRP) area. The proposed action was advertised for public scoping in January 2012. The Notice of Intent to prepare this document was published in the Federal Register on February 17, 2012. The Notice of Availability for the Draft Environmental Impact Statement was published in the Federal Register on April 19, 2013. Comments that were received, including the names and addresses of those who commented, are part of the public record for this project and are available for public inspection. Comments were used to develop the alternative array presented in the FEIS. The alternatives respond to a broad range of public sentiment regarding vegetation management, and frame the significant issues related to the decision. This project proposes timber harvest, commercial thinning, precommercial thinning, prescribed fire, reforestation, native grass restoration, and road system improvements to achieve desired age class and species distributions and to improve watershed health. The original FEIS was published in April 2015, and was accompanied by a Draft Record of Decision (ROD) identifying the alternative selected by the Forest Supervisor for the Clear Creek Integrated Restoration Project. The 45-day objection period for the Draft ROD began February 26, 2015. In response to objections received for the Draft ROD, the FEIS was updated and republished in September 2015. The Forest Supervisor plans to issue a Final ROD in October 2015.

Table of Contents

List of Tables

List of Figures

Summary

The Nez Perce–Clearwater National Forests are proposing a combination of regeneration harvest, commercial thinning, precommercial thinning, prescribed fire, and reforestation to achieve desired age and size classes, species distributions, habitat diversity, and landscape patterns across forested portions of the Clear Creek drainage. Road decommissioning, culvert replacements, and road improvements are proposed to improve watershed health, and the restoration of 41 acres of bunchgrass communities through revegetation with native grasses and forbs is proposed to improve vegetative diversity. The project area comprises 43,731 acres of National Forest System lands within the Clear Creek drainage, located approximately 5 air miles southeast of Kooskia, Idaho.

The purpose of the Clear Creek Integrated Restoration Project (Project) is to manage forest vegetation to restore natural disturbance patterns; improve long-term resistance and resilience at the landscape level; reduce fuels; improve watershed conditions; improve elk habitat effectiveness; improve habitat for early seral species; and maintain habitat structure, function, and diversity. Timber outputs from the proposed action would be used to offset treatment costs, support the economic structure of local communities, and provide for regional and national needs.

Desired conditions for the Project area were identified after careful consideration of the existing condition of the area; applicable Forest Plan management direction, recommendations in the Selway and Middle Fork Clearwater Rivers Subbasin Assessment (USDA Forest Service 2001); and the needs, opportunities, and issues identified by a site-specific interdisciplinary watershed assessment and pre-National Environmental Policy Act (pre-NEPA) analysis conducted in 2011 for the Project area. Completing the Project will move the area toward a Desired Future Condition as defined in the Nez Perce National Forest Plan[1] (USDA Forest Service 1987a, pp. II-1 and II-2).

The Clear Creek Project is part of the larger Selway-Middle Fork Clearwater Collaborative Forest Landscape Restoration Project. In 2010, the Clearwater Basin Collaborative (CBC) in partnership with the Nez Perce–Clearwater National Forests produced a comprehensive restoration strategy that was submitted for funding through the Collaborative Forest Landscape Restoration Program (CFLRP). This science-based proposal was designed to restore and maintain ecological conditions within the 1.4-million-acre Selway–Middle Fork ecosystem in Idaho. The Selway-Middle Fork Clearwater CFLRP proposal includes the following goals:

- Protect communities, private lands, and Wild and Scenic River corridors from uncharacteristic wildland fires

[1] Forest Plan direction for this project is found in the Nez Perce National Forest Plan (USDA Forest Service 1987b) since the project area lies within the administrative boundaries of the Nez Perce National Forest. The Nez Perce and Clearwater National Forests were administratively combined in February 2013, but the existing Forest Plans for each Forest will continue to guide management actions until the Forest Plans are revised. Revision of the 1987 Forest Plans is currently ongoing.

- Reestablish and perpetuate landscapes that are diverse and resilient
- Restore forest structure, function, and ecologic processes that promote aquatic health
- Restore forest structure, function, and ecologic processes that promote habitat for big game and other terrestrial species
- Contain or eliminate noxious weeds
- Promote landscape conditions that allow fire to function as the primary restoration agent
- Contribute to the economy and sustainability of rural communities

Watershed improvement needs were identified during the pre-NEPA stage of this EIS. To accelerate watershed recovery, some watershed improvement activities were authorized under separate decision documents. The effects of those projects have been incorporated into the existing condition of this EIS or have been addressed in the cumulative effects analysis for this project. Watershed improvement projects associated with the Clear Creek Integrated Restoration project include: 10 miles of system road decommissioning, 73 miles of non-system road decommissioning, 4 miles of road reconstruction, 49 culvert replacements, and 22 culvert removals. Most of these projects have already been implemented. Future projects include the Clear Ridge Non-System Road Decommissioning Project, which proposes decommissioning 65 miles of nonsystem roads and removing 15 culverts (see Appendix J of FEIS for a more detailed outline).

The Selway–Middle Fork Clearwater area is identified as a top priority for restoration in national, regional, state, and county plans and in a subbasin assessment. The 43,731 acres of National Forest System lands in the Clear Creek watershed lies within the Selway–Middle Fork Clearwater CFLRP area.

A Notice of Intent (NOI) advertising the scoping period was published in the Federal Register on January 6, 2012. A corrected NOI was published on February 9, 2012, updating the contact information that was published in the original notice. A second corrected NOI was published on February 13, 2012, extending the comment due date to March 1, 2012. A third corrected NOI, advertising two proposed site-specific Forest Plan amendments that are included in this Final Environmental Impact Statement (FEIS), was advertised on February 7, 2013.

The original FEIS was published in April 2015, and was accompanied by a Draft Record of Decision (ROD) identifying the alternative selected by the Forest Supervisor for the Clear Creek Integrated Restoration Project. The 45-day objection period for the Draft ROD began February 26, 2015. In response to objections received for the Draft ROD, the FEIS was updated and republished in September 2015. The Forest Supervisor plans to issue a Final ROD in October 2015.

The Clear Creek Integrated Restoration project has been presented at quarterly meetings with the Nez Perce Tribe since April 2012.

The project was presented for public scoping in January 2012. The following issues related to the project proposal were raised during scoping:

- Increasing patch sizes and reducing fragmentation
- Improving the availability and distribution of foraging habitat relative to hiding cover
- Increasing the amount of early successional stands and wildlife foraging habitats
- Improving forest structure
- Providing jobs in Idaho County
- Reducing planning and implementation costs by managing on a large scale
- Reducing total road mileages and densities in the Clear Creek watershed
- Reducing sediment input to stream channels
- Reducing cumulative impacts of past timber harvest and road building on fisheries habitat, water quality, and soil productivity
- Reducing effects of the road network on elk security habitat
- Meeting Desired Future Conditions for watersheds, fish, and wildlife habitats

These issues led the interdisciplinary team to develop alternatives to the proposed action. This FEIS analyzes a total of four alternatives, including a No Action Alternative. The alternatives are briefly summarized below. The issues and alternatives are described in greater detail in Chapter 2.

These activities are common to all action alternatives: 41 acres of grass restoration, 1,371 acres of prescribed fire, 1,887 acres of precommercial thinning, 119.8 miles of system road reconstruction, 48.8 miles of system road reconditioning, 13.2 miles of system road decommissioning, and two site-specific Forest Plan amendments adopting the Region 1 soil standard of 15% for detrimentally disturbed soils, and clarifying the definition of old growth found in Appendix N of the Nez Perce Forest Plan.

Alternative A (No Action)

This alternative provides a baseline for comparing the environmental consequences of the other alternatives. Under the No Action alternative, no project activities would be implemented.

Alternative B (Proposed Action, as Modified in Response to Scoping Comments)

This alternative was developed in response to the purpose and need for action identified during the pre-NEPA phase of project development. It was presented for public scoping in January 2012. Alternative B would move the project area toward the desired future conditions (DFCs) that were identified for the project during the pre-NEPA phase. In addition to the activities common to all action alternatives, Alternative B proposes 2,609 acres of regeneration harvest, site preparation, and reforestation; 331 acres of improvement harvest; 5,606 acres of commercial thinning; 8.7 miles of temporary road construction on existing templates; and 27.6 miles of new temporary road construction.

Alternative C (Maximal Species Conversion)

This alternative would address vegetative restoration needs described in the purpose and need for action but to a greater degree than Alternative B. Alternative C would regenerate as many stands as possible while meeting objectives for other resources. In addition to the activities common to all action alternatives, Alternative C would include 4,156 acres of regeneration harvest, site preparation, and reforestation; 331 acres of improvement harvest; 4,220 acres of commercial thinning; 8.7 miles of temporary road construction on existing templates; and 27.6 miles of new temporary road construction.

Alternative D (Minimal Road Construction)

Alternative D would address the need for vegetative rehabilitation in the Clear Creek watershed but to a lesser degree than Alternative B. Alternative D would use existing road templates as much as possible while still meeting the need for vegetative restoration. In addition to the activities common to all action alternatives, Alternative D would include 2,178 acres of regeneration harvest, site preparation, and reforestation; 211 acres of improvement harvest; 5,141 acres of commercial thinning; 8.7 miles of temporary road construction on existing templates; and 8.8 miles of new temporary road construction.

To help describe the environmental effects of each alternative as they pertain to the identified issues, the interdisciplinary team developed "indicators" that help measure the differences between the alternatives. The effects of the alternatives, as measured by these indicators, are summarized in Table S-1.

Table S-1. Summary of Environmental Consequences by Issue Indicator

Issue Indicator	Alternative A (Existing Condition)	Alternative B	Alternative C	Alternative D
Aquatics/Fisheries Habitat:				
Riparian Habitat Conservation Area (RHCA) Road Density				
– Upper Clear Creek HUC6	1.4 mi/mi^2	1.2 mi/mi^2	1.2 mi/mi^2	1.2 mi/mi^2
– South Fork Clear Creek HUC6	1.0 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2
– Lower Clear Creek HUC6	9.3 mi/mi^2	8.9 mi/mi^2	8.9 mi/mi^2	8.9 mi/mi^2
Number of undersized culverts replaced and cross drains added	0	69	69	69
FISHSED results for modeled changes in cobble embeddedness				
– Hoodoo Creek	33%	35%	36%	35%
– Solo Creek	31%	33%	33%	33%
– Pine Knob Creek	44%	46%	46%	46%
– Clear Creek	38%	40%	40%	40%
– Middle Fork Clear Creek	55%	56%	56%	56%
– Brown Springs Creek	30%	33%	33%	32%
– South Fork Clear Creek	20%	21%	21%	21%
– Kay Creek	20%	20%	20%	20%
Economics:				
Volume Harvested (CCF)	0	141,500 CCF	158,000 CCF	116,400 CCF
Volume Harvested (MBF)	0	75,300	85,200	61,800

Issue Indicator	Alternative A (Existing Condition)	Alternative B	Alternative C	Alternative D
Jobs Sustained	0	1,910 jobs	2,133 jobs	1,571 jobs
Community Harvest Income	0	$54,252,000	$60,578,000	$44,628,000
Federal Income Tax	0	$8,138,000	$9,087,000	$6,694,000
Present Net Value	0	$5,748,000	$5,264,000	$3,886,000
Fuels:				
Fire Regime Condition Class (FRCC)	FRCC2	FRCC2	FRCC2	FRCC2
Percentage of Crown Fire Susceptible Landscape	51%	44%	44%	44%
Soils:				
Acres of ground based harvest activity on landtypes with high sub-surface erosion	0	2,920	2,920	2,825
Miles of temp roads on landtypes with high sub-surface erosion	0	30 miles	30 miles	15 miles
Number of commercial harvest units requiring specialized design measures	0	77	78	75
Vegetation:				
Percent Increase Of Treatment Area With Forest Cover Type Dominated By Long-Lived Early Seral Species	0	13.26/73.96 61	9.06/72.72 64	14.92/74.39 59
Percent Change Of The Treatment Area In Each Stand Age Class:				
– Young (0-40 years)	0	68	57	64
– Mid-Seral (41-100 years)	0	-30	-35	-31
– Mature (101-149 years)	0	-24	-14	-21
– Old (150+ years)	0	-15	-9	-13
Dominant Vertical Structure Pattern Across Landscape	1 and 2 storied	1 and 2 storied	1 and 2 storied	1 and 2 storied
Patch Sizes Of The Structural Classes (Mean Patch Size In Acres):				
– Seral Shrub	179	252	252	252
– Stand Initiation	48	96	104	91
– Stem Exclusion	115	131	119	128
– Understory Reinitiation	62	83	83	83
– Young Multi-Story	27	26	904	26
– Old Single-Story	77	116	121	116
– Old Multi-Story	74	81	72	81
Watershed:				
Percent increase in equivalent clearcut area (ECA)				
-Upper Clear Creek HUC 6	0	12%	13%	11%
– South Fork Clear Creek HUC 6	0	6%	7%	5%
– Lower Clear Creek HUC 6	0	7%	9%	6%
– Clear Creek HUC 5	0	8%	9%	7%

Issue Indicator	Alternative A (Existing Condition)	Alternative B	Alternative C	Alternative D
Percent sediment yield increased over base (natural) as modeled by NEZSED (Forest Plan Standard)				
– Pine Knob Creek (45%)	1%	18%	18%	18%
– Browns Spring Creek (45%)	2%	29%	30%	27%
– Clear Creek (30%)	1%	18%	18%	15%
– Solo Creek (45%)	2%	21%	21%	19%
– Middle Fork Clear Creek (30%)	1%	11%	11%	9%
– Kay Creek (45%)	1%	5%	5%	4%
– South Fork Clear Creek (45%)	1%	9%	10%	7%
– Hoodoo Creek (60%)	2%	31%	32%	27%
Watershed road density(mi/mi^2)				
– Pine Knob Creek	4.8	4.3	4.3	4.3
– Browns Spring Creek	4.1	3.2	3.2	3.2
– Clear Creek	2.3	2.3	2.3	2.3
– Solo Creek	3.5	3.1	3.1	3.1
– Middle Fork Clear Creek	2.4	2.2	2.2	2.2
– Kay Creek	2.6	2.4	2.4	2.4
– South Fork Clear Creek	1.6	1.6	1.6	1.6
– Hoodoo Creek	4.6	3.8	3.8	3.8
– Big Cedar Creek	4.6	4.4	4.4	4.4
– Lower Clear Creek Face	1.8	1.8	1.8	1.8
Wildlife:				
Acres of habitat treated—Black-backed Woodpecker	0	509	510	463
Acres of habitat treated—Fisher – Winter habitat – Summer habitat	 0 0	 3,334 580	 2855 580	 2,013 438
Acres of habitat treated—Flammulated Owl	0	38	38	34
Acres of habitat treated—Fringed Myotis	0	47	47	39
Acres of habitat treated—Long-eared Myotis	0	1,278	1,283	877
Acres of habitat treated—Long-legged Myotis	0	1,278	1,283	877
Acres of habitat treated—Mountain Quail	0	35	35	35
Acres of habitat treated—Northern Goshawk Nesting	0	298	298	290
Acres of habitat treated—Pileated Woodpecker Nesting	0	875	875	772
Acres of habitat treated—American Marten	0	1,562	1,569	1,152
Acres of habitat treated—Pygmy Nuthatch	0	780	80	64

Issue Indicator	Alternative A (Existing Condition)	Alternative B	Alternative C	Alternative D
Acres of habitat treated—Ringneck Snake	0	493	493	389
Acres of habitat treated—Western Toad Uplands	0	59	55	63
Acres of habitat treated—Moose Winter Range (MA 21)	0	776	776	630
Elk Winter Range – Acres treated	0	4,380	4,502	3,809
Elk Summer Range – analysis areas meeting Forest Plan standards (50%)	7	7	7	7
Lynx Denning Acres Treated	0	0	0	0
Lynx Foraging Acres Treated	0	66	61	57

After considering the potential effects of the alternatives, the Responsible Official will select an action or mix of actions to improve ecological conditions in the project area and best meet the social values associated with this piece of land. If the No Action Alternative is selected, no other decision will be necessary. If an action alternative is selected, the Responsible Official will decide what design criteria, management requirements, and monitoring are needed for its implementation.

Summary of Changes between Draft and Final EIS

The Design Criteria described in Chapter 2 have been updated and more clearly described. Additional Design Criteria for soils, wildlife, aquatics, recreation (trails), and visuals were developed by the IDT. New appendices have been added to the FEIS describing soil design criteria, wildlife considerations, target stands, a unit summary, and past activities, and maps have been added displaying harvest activities by decade and Wildland User Interface (WUI) information. In response to comments that were received for the DEIS, the analyses for economics, aquatics, and fisheries have been updated, and effects analyses for visuals and cultural resources have been added. The References section of the FEIS has also been updated in response to comments on the DEIS. Chapter 3 has been relabeled Affected Environment and Environmental Consequences.

A more detailed discussion of changes between the Draft and Final EIS can be found in Chapter 2.

The IDT considered developing several additional alternatives in response to comments that were received for the DEIS. However, no additional alternatives were added to the array analyzed in the DEIS. Please see the “Alternatives Considered but Eliminated from Detailed Study” section in Chapter 2 for a description of the alternatives that were considered, and the reasons why they were not analyzed in detail.

Document Organization

The Forest Service has prepared this FEIS in compliance with the NEPA and other relevant federal and State laws and regulations. This FEIS discloses the direct, indirect, and cumulative environmental impacts that would result from the proposed action and alternatives. The document is organized into 4 chapters and 10 appendices:

- *Chapter 1. Purpose and Need for Action:* The chapter includes information on the history of the project proposal, the purpose of and need for the project, and the agency's proposal for achieving that purpose and need. This section also details how the Forest Service informed the public of the proposal and how the public responded.
- *Chapter 2. Alternatives, including the Proposed Action:* This chapter provides a more detailed description of the agency's proposed action as well as alternative methods for achieving the stated purpose. These alternatives were developed based on significant issues raised by the public and other agencies. This discussion also includes design criteria. Finally, this section provides a summary table of the environmental consequences associated with each alternative.
- *Chapter 3. Affected Environment and Environmental Consequences*: This chapter describes the environmental effects of implementing the proposed action and other alternatives. This analysis is organized by resource area.
- *Chapter 4. Consultation and Coordination:* This chapter provides a list of preparers and agencies consulted during the development of the FEIS.
- *Chapter 5.* Glossary and Acronyms.
- *Chapter 6.* References. The References section includes documents that were used to develop the analysis in the FEIS and to respond to public comments.
- *Chapter 7.* Index. The Index provides page numbers by document topic.
- *Appendices:* The appendices provide more detailed information to support the analyses presented in the FEIS. Appendix A, Maps, is included with Volume 1. The other Appendices are included in Volume 2. This FEIS includes these appendices:
    - Appendix A includes maps of the project area.
    - Appendix B describes proposed road work.
    - Appendix C provides details about the proposed site-specific Forest Plan amendment to adopt the Regional soil standard.
    - Appendix D describes the proposed site-specific Forest Plan amendment for old growth.
    - Appendix E describes design criteria for soils.
    - Appendix F provides additional information about wildlife species that were considered in the analysis.
    - Appendix G describes target stand conditions for the project area.
    - Appendix H provides a list of treatment units in the project area.
    - Appendix I describes past activities in the Clear Creek drainage.

- Appendix J describes watershed improvement activities providing an upward trend in watershed condition.
- Appendix K describes the effectiveness of road best management practices
- Appendix L contains the responses to comments to the Draft Environmental Impact Statement

Additional documentation, including more detailed analyses of project-area resources, may be found in the project planning record located at the Nez Perce-Clearwater National Forests Supervisor's Office, 903 3rd Street, Kamiah, Idaho 83536.

Chapter 1–Purpose of and Need for Action

The Nez Perce–Clearwater National Forest is proposing a combination of timber harvest, commercial thinning, precommercial thinning, prescribed fire, and reforestation to achieve desired age and size classes, species distributions, habitat diversity, and landscape patterns across forested portions of the Clear Creek drainage. Road decommissioning, culvert replacements, and road improvements are proposed to improve watershed health, and the restoration of 41 acres of bunchgrass communities through revegetation with native grasses and forbs is proposed to improve vegetative diversity and reduce the spread of noxious weeds.

1.1 Project History

Congress established the Collaborative Forest Landscape Restoration Program (CFLRP) with Title IV of the Omnibus Public Land Management Act of 2009. In addition to encouraging the collaborative, science-based ecosystem restoration of priority forest landscapes, the CFLRP has the following program goals:

- Encourage ecological, economic, and social sustainability
- Leverage local resources with national and private resources
- Facilitate the reduction of wildfire management costs, including through re-establishing natural fire regimes and reducing the risk of uncharacteristic wildfire
- Demonstrate the degree to which various ecological restoration techniques achieve ecological and watershed health objectives
- Encourage utilization of forest restoration by-products to offset treatment costs, benefit local rural economies, and improve forest health

The CFLRP established a fund to be used for restoration work on priority landscapes. Up to $4 million annually can be requested by selected projects. The Clearwater Basin Collaborative (CBC), in partnership with the Nez Perce-Clearwater Forests, developed and submitted a comprehensive restoration proposal, the Selway–Middle Fork Clearwater project, in 2010. The proposal outlined an ambitious strategy to plan and implement a number of projects, such as aquatic restoration, weed treatments, road decommissioning, fuel reductions, and forest restoration, across the 1.4-million-acre Selway–Middle Fork Clearwater ecosystem in Idaho. The Selway–Middle Fork Clearwater area is identified as a top priority for restoration in national, regional, State, and County plans and in a forest subbasin assessment. The Selway–Middle Fork Clearwater CFLRP proposal included the following goals:

- Protect communities, private lands, and Wild and Scenic River corridors from uncharacteristic wildland fires
- Reestablish and perpetuate landscapes that are diverse and resilient
- Restore forest structure, function, and ecologic processes that promote aquatic health

- Restore forest structure, function, and ecologic processes that promote habitat for big game and other terrestrial species
- Contain or eliminate noxious weeds
- Promote landscape conditions that allow fire to function as the primary restoration agent
- Contribute to the economy and sustainability of rural communities

Proposals were reviewed in Washington, D.C., by the CFLRP Advisory Committee and 10 recommendations were forwarded to the Secretary of Agriculture for funding. The Selway–Middle Fork Clearwater project was selected for funding by the Secretary of Agriculture in August 2010.

At the heart of the proposal was the Clear Creek landscape, selected as a priority for treatment by the Forests and the CBC. In August 2010, Clear Creek was selected for an assessment to determine the types, locations, and amounts of appropriate management actions that would address CFLRP goals and objectives. The Interdisciplinary Team (IDT) prepared this assessment of the Clear Creek watershed in 2011; the assessment summarized Nez Perce Forest Plan direction appropriate to the Clear Creek area, compared existing landscape conditions to desired conditions described in the Forest Plan, and identified projects that would implement the CFLRP intent, while meeting, or progressing toward, desired conditions.

Projects recommended through the 2011 assessment would promote forest conditions that are resistant to forest pathogens and invasive species and resilient to wildfire and climate change; reduce wildfire risks on National Forest System (NFS)–managed lands that are adjacent to private property; promote healthy riparian and stream habitats important for fish and wildlife species; promote forest habitats that support productive populations of elk, moose, goshawk, pileated woodpecker, fisher, flammulated owl, and old forest habitats; develop a road system that provides administrative, recreational, and industrial uses while protecting sensitive habitats, minimizing sediment delivery to streams, and minimizing road construction and maintenance costs; and provide social and economic benefits to local communities.

Desired conditions for the Clear Creek watershed were developed using Nez Perce National Forest Plan (Forest Plan) (USDA Forest Service 1987a) direction; broad-scale assessments (e.g., Integrated Scientific Assessment for Ecosystem Management in the Interior Columbia Basin [USDA Forest Service 1997] and Selway and Middle Fork Clearwater Rivers Subbasin Assessment [USDA Forest Service 2001]); and the best science currently available. The development of desired conditions for the Clear Creek project was periodically reviewed by the CBC for consistency with the CFLRP and to ensure that the project proposal was socially, ecologically, and economically robust. In the spirit of transparency, these same desired conditions were also shared with and input solicited from other routine Forest planning participants (e.g., Friends of the Clearwater and Alliance for the Wild Rockies).

During the pre-National Environmental Policy Act (pre-NEPA) phase of Project development, the IDT identified large polygons or patches within the Project area referred to as “Focus Areas.” The Focus Areas were identified based on a need to promote similar age classes by connecting recently regenerated stands (preferably within the last 20 years). The intent was to establish breaks in continuous fuels, favor areas with known or developing forest health issues, and target over-represented mid seral and mature age classes. The IDT also attempted to bound these areas with identifiable features, such as forest type breaks, topographic breaks, and administrative boundaries. The Focus Areas served as the basis for developing the Proposed Action.

A new Focus Area, developed after the Proposed Action was presented for scoping, has been added to all of the action alternatives in this Final Environmental Impact Statement (FEIS). It includes about 420 acres of regeneration harvest and some commercial thin and precommercial thin units lying outside of the original configuration of the Focus Areas. The new Focus Area includes 1.2 miles of temporary roads, some of which would be on existing templates.

A Notice of Intent (NOI) advertising the scoping period was published in the Federal Register on January 6, 2012. A corrected NOI was published on February 9, 2012, updating the contact information that was published in the original notice. A second corrected NOI was published on February 13, 2012, extending the comment due date to March 1, 2012. A third corrected NOI, advertising two proposed site-specific Forest Plan amendments that are included in this Final Environmental Impact Statement (FEIS), was advertised on February 7, 2013.

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1.2 Project Area

The Clear Creek drainage lies within the Middle Fork Clearwater River drainage near Kooskia, Idaho. The Clear Creek drainage totals 65,000 acres, with 33% (21,269 acres) in private or State ownership and the remaining 67% (43,731 acres) under the management of the Moose Creek Ranger District. The Clear Creek Integrated Restoration Project area includes all 43,731 acres of NFS lands within the Clear Creek drainage (Figure 1-1).

All of the project area lies within the upper two-thirds of the drainage. The project area is located approximately 5 air miles southeast of Kooskia, Idaho, within Townships 30, 31, and 32 N, Ranges 5 and 6 E, Boise Meridian.

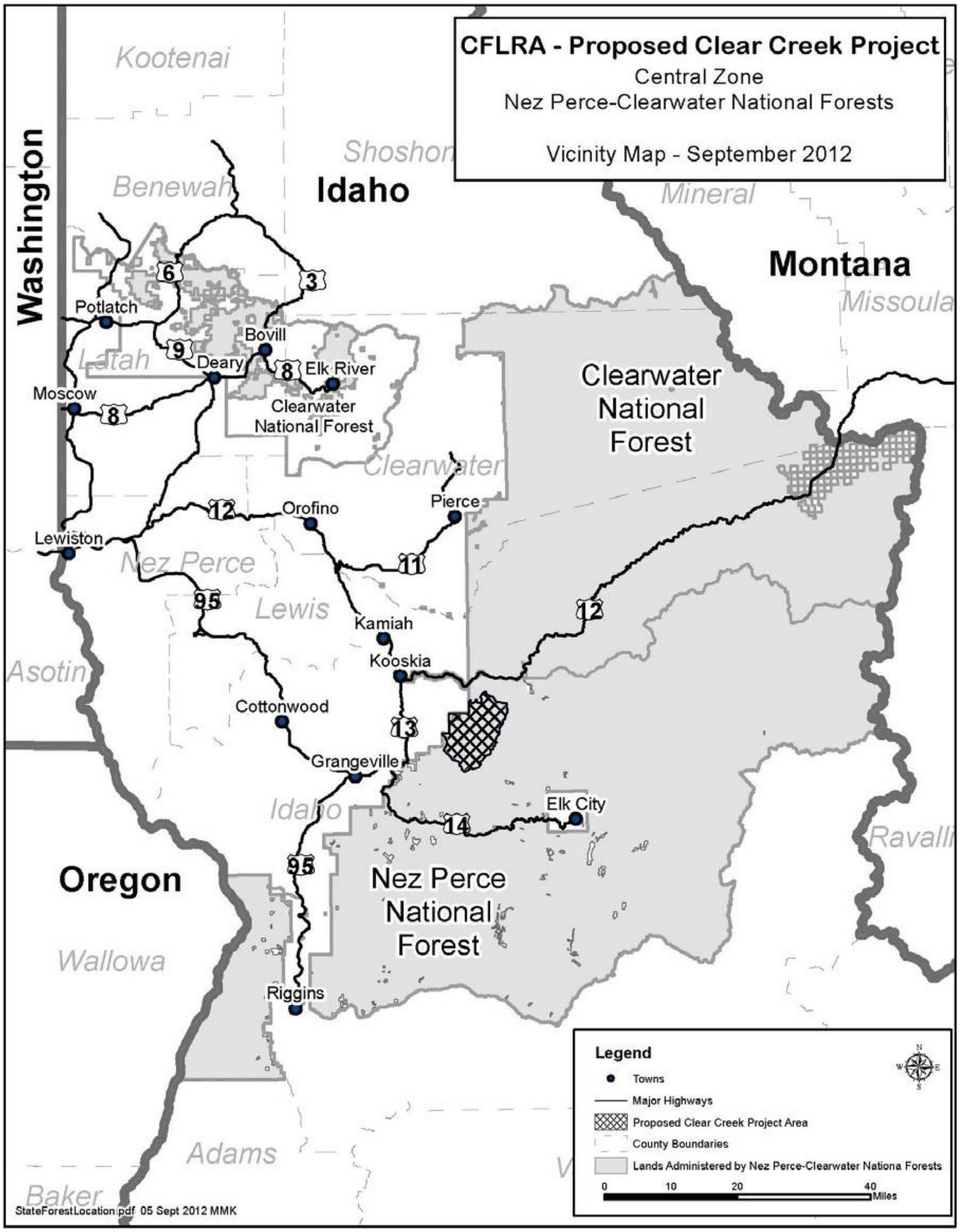


Figure 1-1. Clear Creek Integrated Restoration Project Vicinity Map

1.3 Purpose of and Need for Action

The purpose of the project is to manage forest vegetation to restore natural disturbance patterns; improve long-term resistance and resilience at the landscape level; reduce fuels; improve watershed conditions; improve early seral wildlife habitat; and maintain habitat structure, function, and diversity. These actions are needed to move resource conditions in the project area from existing conditions toward desired conditions. Timber outputs from the proposed action would be used to offset treatment costs, support the economic structure of local communities, and provide for regional and national needs.

The following resource management opportunities were identified for the Project area based on the existing condition of the area, applicable Forest Plan management direction; recommendations in the Selway and Middle Fork Clearwater Rivers Subbasin Assessment (USDA Forest Service 2001); and the needs, opportunities, and issues identified by an interdisciplinary watershed assessment and National Forest Management Act (NFMA) analysis conducted in 2011.

1.3.1 Vegetation and Wildlife Habitat Improvement

1.3.1.1 Existing Condition

Historic logging practices and fire suppression have affected the diversity of tree species in the Project area. Ladder fuels have increased, and a shift to more shade-tolerant species has occurred. Currently, a higher percentage of grand fir and Douglas-fir exist than natural long-term disturbances patterns would have created and that would have dominated these habitat types in the absence of historic logging and fire suppression. Grand fir and Douglas-fir are more susceptible to insects and disease and grand fir is less likely to survive intense wildfires than early seral species (e.g., ponderosa pine, western larch, and western white pine).

In addition to affecting species composition, young forest habitat is lacking on this landscape. Patches of young forest that do exist are smaller with edges that are straighter and more even than natural disturbances would have created.

1.3.1.2 Desired Condition

The desired condition is a forest structure with a range of age and size classes with species diversity that is resistant and resilient to change agents such as insects, diseases, and wildfires. Early seral species should represent a greater percentage of the species mix.

1.3.1.3 Need for Action

Vegetation in this area needs to be managed to create a more diverse and resilient forest structure by creating a range of age and size classes, species diversity, and disturbance patterns that more closely emulate the results of natural disturbance. A need exists to shift tree species composition away from shade-tolerant species toward more resistant and resilient early seral species. A need also exists to increase diversity within previously harvested areas to restore long-term habitat quality for sensitive and old growth-associated species and to manage vegetation to increase young forest habitat.

1.3.2 Goods and Services

1.3.2.1 Existing Condition

Much of the Project area consists of grand fir-dominated stands. Insect and disease infestations are contributing to increased tree mortality, while decreasing timber volume and value.

1.3.2.2 Desired Condition

The desired condition is to provide a sustained yield of resource outputs as directed by the Nez Perce Forest Plan.

1.3.2.3 Need for Action

Stands that are infested with insects and diseases need to be treated so that the harvested timber can provide materials for local industries.

1.3.3 Watershed Improvement

1.3.3.1 Existing Condition

Gravel and native surface roads could contribute sediment to stream channels, which can affect water quality and fish habitat. The road system in the Clear Creek watershed has already been substantially reduced. The West Fork-South Fork Clear Creek Road Decommissioning Decision Notice/Finding of No Significant Impact (DN/FONSI) (USDA Forest Service 2011c) project decommissioned 85 miles of roads. However, additional road decommissioning opportunities are available in the Clear Creek watershed.

1.3.3.2 Desired Condition

The desired condition is a well-maintained road system in the Clear Creek watershed that is disconnected from stream networks and adequate to provide for the goals and objectives described in the Nez Perce Forest Plan (primarily timber harvest, recreation, fire suppression, and administrative use).

1.3.3.3 Need for Action

Improving watershed function and stream conditions by reducing road densities and repairing existing roads and culverts to reduce sediment and improve drainage is needed. Watershed function can also be improved by restoring compacted soils and adding organic material on old skid trails and landings.

1.4 PROPOSED ACTION

The action that was proposed by the Forest Service for scoping in January 2012 is briefly described below. The Proposed Action was modified slightly in response to scoping comments that were received; the modified proposed action is described as Alternative B in this FEIS in Chapter 2.

Improve forest health, provide goods and services, reduce fuels, and improve wildlife habitat:

- Conduct "variable retention" regeneration harvest and post-harvest burning activities on up to 2,500 to create early successional plant communities and improve wildlife habitat while reestablishing long-lived early seral tree species. Variable retention harvest would include areas of full retention (clumps) with irregular edges. Snags and legacy trees would be retained to provide structure and a future source of woody debris. Openings would probably exceed 40 acres.
- Commercially thin approximately 7,810 acres to reduce stand densities, improve forest health, and reduce the chance of crown fire.
- Apply improvement harvest (thin from below) to approximately 311 acres to remove encroachment and ladder fuels from ponderosa pine–dominated stands.
- Construct a minimum temporary road system to carry out the proposed action. Roads would be decommissioned after use.
- Precommercially thin approximately 1,865 acres to reduce stand densities, improve forest health, and reduce fuels.
- Restore approximately 42 acres of bunchgrass communities through prescribed burning and revegetation with native grasses and forbs to improve vegetative diversity and reduce the spread of noxious weeds.
- Apply approximately 1,400 acres of low and mixed severity prescribed fire within the Clear Creek Roadless Area to restore natural fire regimes, reduce fuels, improve wildlife habitat, and create mosaic forest conditions. Proposed activities would be consistent with the Idaho Roadless Rule and no timber cutting is proposed within the Clear Creek Roadless area.

Reduce sediment production and address transportation needs:

- Maintain or improve approximately 100–130 miles of system roads. Maintenance and improvement could include culvert installation or replacement, ditch cleaning, riprap placement for drainage improvement, gravel placement, road grading, or dust abatement.
- Conduct additional site-specific maintenance or improvements on up to 20 miles of roads outside of proposed treatment areas to improve watershed conditions
- Remove from the system between 2–5 miles of system roads no longer considered necessary for transportation needs by decommissioning.

Amend the Soils section of the Nez Perce Forest Plan:

- A site-specific, nonsignificant Forest Plan amendment adopting Region 1 soils standards would be included. The current Nez Perce Forest Plan standard specifies that there can be no new activities in areas where detrimental soil disturbance (DSD) is over 20%. Currently, Region 1 soil quality standards (USDA Forest Service 2014) specify that at least 85% of an activity area (defined as a land area affected by a management activity) must have soil that is in satisfactory condition. In other words, detrimental impacts (including compaction, displacement, rutting, severe burning, surface erosion, and mass wasting) shall be <15% of an activity area. In areas where >15% detrimental soil conditions exist from prior activities, the cumulative detrimental effects from proposed activities, including restoration, shall not exceed the conditions prior to the proposed activity and should move toward a net improvement in soil quality. The proposed amendment would change Forest Plan Soil Standard #2 and allow activities to occur on areas with >20% DSD, as long as soil improvement activities are implemented.

Amend Appendix N of the Nez Perce Forest Plan (1987):

- A site-specific, nonsignificant Forest Plan amendment clarifying the Forest's interpretation of Appendix N of the Nez Perce Forest Plan would be included. The purpose of this amendment would be to replace the Forest Plan Appendix N definitions of old growth with the definitions found in Old Growth Forest Types of the Northern Region (Green, et al., 1992, errata corrected 02/05, 12/07, 10/08, 12/11). The Green et al. definitions are regarded as the "best available science" for the classification of old growth at the site-specific level. This nonsignificant amendment is site-specific, and would apply only to the Clear Creek Integrated Restoration Project action alternatives. This amendment would not apply to any activities or projects outside the project area.

1.5 Decision Framework

The Responsible Official for this project is Forest Supervisor, Cheryl Probert. In making her decision, the Responsible Official will review the purpose and need, the Proposed Action and other alternatives, the environmental consequences, and public comment to make the following decisions:

- Should vegetation restoration in the Project area be completed, and if so, which forested stands should be treated and what silvicultural treatments should be applied?
- Should temporary roads be constructed, and if so, how many miles of road should be constructed and where should they be constructed?
- What design features, mitigation measures, and/or monitoring should be applied to the Project?

1.6 Public Involvement

A Notice of Intent (NOI) advertising the scoping period was published in the Federal Register on January 6, 2012. A corrected NOI was published on February 9, 2012, updating the contact information that was published in the original notice. A second corrected NOI was published on February 13, 2012 extending the comment due date to March 1, 2012. A third corrected NOI, advertising two proposed site-specific Forest Plan amendments that were included in the DEIS, was advertised on February 7, 2013.

As part of the public involvement process, the agency also listed the proposal in the quarterly Schedule of Proposed Actions beginning April 2012. The Project has been presented to the Nez Perce Tribe at quarterly staff-to-staff meetings since April 2012. The CBC has been involved in project development since 2010 when the Clear Creek watershed was selected for assessment to determine the types, locations, and amount of appropriate management actions that would address CFLRP goals and objectives.

The Proposed Action was initially developed from preliminary issues, concerns, and existing conditions that were identified by the IDT. The IDT used issues raised by the public, other agencies, and the Nez Perce Tribe to develop the scope of the actions, alternatives, and effects to consider in the DEIS. Many of the issues were addressed through project design criteria and resource protection measures. The DEIS was advertised for public comment in April 2013. Forty-one comment documents were received, containing more than 525 individual comments. Those comments have been addressed in the FEIS through design criteria, project design, and alternative development.

During 2013, the District Ranger and the IDT hosted field trips to the project area that were attended by the Nez Perce Tribe, the Clearwater Basin Collaborative, and other interested groups.

1.6.1 Changes between Draft and Final Environmental Impact Statement

The IDT considered developing several additional alternatives in response to comments that were received for the DEIS. However, additional alternatives were not added to the array analyzed in the DEIS. Please see the “Alternatives Considered but Eliminated from Detailed Study” section in Chapter 2 for a description of the additional alternatives that were considered, and the reasons why they were not analyzed in detail.

The Design Criteria described in Chapter 2 have been updated and more clearly described. Additional Design Criteria for soils, wildlife, aquatics, and recreation (trails) were developed by the IDT. Appendix E has been added to the FEIS, describing the Design Criteria for soils in detail.

Supplementary information and additional maps have been added to the Appendices for the FEIS. The new appendices are as follows:

- Appendix E, Soil Design Criteria Summary
- Appendix F, Wildlife
- Appendix G, Nez Perce and Clearwater National Forests Target Stands for Multiple Objectives
- Appendix H, Unit Summary
- Appendix I, Past Activities
- Appendix J, Upward Trend

Chapter 3 has been relabeled Affected Environment and Environmental Consequences.

Chapter 3 of the FEIS has been updated to include a discussion about threatened, endangered, sensitive, rare, and invasive plants.

A discussion about the cost savings associated with treating vegetation in larger areas has been added to the Economics section.

A detailed discussion of Upward Trend has been added to the aquatics section of the FEIS. Additional information about fisheries habitat was added to the FEIS to address comments received for the DEIS about stream conditions. The FEIS includes clarifying information regarding upward trend for Pine Knob, Middle Fork Clear Creek, and the mainstem of Clear Creek.

Appendix J of the FEIS includes a more detailed discussion of watershed improvement actions that were included in other projects.

Effects analyses for Visual Quality and Cultural Resources have been added to the FEIS.

The effects analyses for Aquatics, Vegetation, Watershed, and Wildlife have been updated in response to objections that were received for the Draft Record of Decision.

The References section of the FEIS has been updated in response to comments that were received for the DEIS. Many documents have been added to the project file supporting the analysis in this FEIS.

Maps displaying harvest activities by decade and the Wildland User Interface (WUI) have been added to Appendix A.

1.7 ISSUES

The Forest Service separated the issues into two groups: significant and nonsignificant. Significant issues were defined as those directly or indirectly caused by implementing the Proposed Action. Nonsignificant issues were identified as those outside the scope of the proposed action; already decided by law, regulation, Forest Plan, or other higher level decision; irrelevant to the decision to be made; or conjectural and not supported by scientific or factual evidence. The Council on Environmental Quality (CEQ) NEPA regulations explain this delineation in Section 1501.7, "…identify and eliminate from detailed study the issues which are not significant or which have been covered by prior environmental review (Sec. 1506.3)…" A list of nonsignificant issues and reasons regarding their categorization as nonsignificant may be found in the project record.

1.7.1 Issues Used to Develop Alternatives to the Proposed Action

Several concerns raised during scoping were used to develop alternatives to the Proposed Action. To address these concerns, the Proposed Action was modified slightly and renamed Alternative B. Two additional action alternatives, Alternatives C and D, were also developed to respond to the concerns raised by scoping commenters.

1.7.1.1 Commercial Thinning Stands Where Root Disease is Present

Some commenters were concerned that commercially thinning stands with root disease could cause the disease to spread, increasing stand mortality. The IDT created Alternative C to address these concerns. Under Alternative B, treatment would be deferred in stands proposed for commercial thinning that are found to have root disease. Thinning would not be an appropriate treatment in these stands because root disease would be likely to spread. However, without treatment, these stands are unlikely to remain on the landscape as long as desired; the stands available for management could be substantially reduced, and deferring treatment in commercially thinned stands with root disease would not move these stands toward Desired Future Conditions (DFCs). Under Alternative C, commercially thinned stands that are found to have root disease would be regenerated. Regenerating these stands would help create larger patch sizes, while increasing the amount of high-quality, early seral wildlife habitat and moving the area toward DFCs for young and old forest.

ISSUE INDICATORS

- Percent of the area with forest cover type dominated by long-lived early seral species compared to grand fir and Douglas-fir.
- Patch sizes

1.7.1.2 Patch Sizes and Fragmentation

Some commenters were concerned that past management has reduced patch sizes and increased fragmentation in the Clear Creek watershed.

Since the 1980s, there has been a trend toward small, isolated harvest units that resulted in patch sizes that are smaller than would have been created through natural disturbance. The resulting forest now includes a fragmented landscape, isolated patches of young forest, and dissected large patches of older forest.

During the pre-NEPA phase of project development, the IDT identified large polygons or patches within the Project area, referred to as “Focus Areas.” The Focus Areas were identified based on a need to promote similar age classes by connecting recently regenerated stands, or by retaining existing large patches of unfragmented forest. The Focus Areas served as the basis for developing the proposed action.

Since Forest managers cannot plan an activity to “create” larger patches of older forest, the IDT chose to focus on reducing landscape fragmentation by treating areas near or adjacent to existing young forest. The resulting large patches of young forest will more closely resemble the disturbance regime and patch size expected from natural disturbances. At the same time, the IDT has not disregarded the importance of patch sizes in older age classes. Retaining existing large patches of unfragmented forest weighed heavily in the development of the Proposed Action. The IDT chose treatment areas that would avoid fragmenting existing patches that currently meet desired patch size conditions according to the DFCs for each Vegetative Response Unit (VRU). It was a priority to “reconnect” areas of young forest that have become fragmented due to past management activities.

Other objectives the IDT considered during development of the proposed action were to establish breaks in areas with continuous fuels in probable fire pathways, target areas with known or developing forest health issues, and to target over-represented mid seral and mature age classes. The IDT also attempted to bound Focus Areas with identifiable features, such as forest type breaks, topographic breaks, and administrative boundaries.

The regeneration harvest proposed for all of the action alternatives would address this issue by increasing patch sizes and reducing fragmentation. Of the three action alternatives, Alternative C would do the most to address this issue because it would regenerate the most stands within the Focus Area configurations.

ISSUE INDICATORS

- Patch size
- Fire Regime Condition Class (FRCC)

1.7.1.3 Early Successional Stands/Young Forest/Wildlife Habitat

Some commenters were concerned that the amount of young forest in the Project area should be increased to improve wildlife foraging habitat.

The regeneration harvest proposed for all of the action alternatives would address this issue by increasing the amount of young forest across the landscape. Of the three action alternatives, Alternative C would do the most to address this issue because it would regenerate the most stands.

ISSUE INDICATORS

- Percent of the area with forest cover type dominated by long-lived, early seral species compared to Grand fir and Douglas-fir
- Percent of the area in each age class
- Vertical structure
- Acres treated in potential suitable habitat for sensitive species (SS)
- Acres treated in Nez Perce Forest Plan Management Area (MA) 16 (Elk Winter Range)
- Acres treated in Nez Perce Forest Plan MA 21 (Moose Winter Range)

1.7.1.4 Forest Structure

Some commenters were concerned that the Forest Service should do more to move vegetation in the Clear Creek watershed toward the desired conditions identified for this area.

The desired condition is a forest structure with a range of age classes, size classes, and species diversity that is resistant and resilient to change agents such as insects, diseases, and wildfires. Early seral species should represent a greater percentage of the species mix. The regeneration harvest proposed for all of the action alternatives would address this issue by increasing the amount of young forest across the landscape, while reducing the amount of mid-seral and mature forest. Of the three action alternatives, Alternative C would do the most to address this issue because it would regenerate more acres.

ISSUE INDICATORS

- Percent of Project area that could support a crown fire
- Percent of the area with forest cover type dominated by long-lived early seral species compared to shade intolerant species
- Percent of the area in each age class
- Vertical structure

1.7.1.5 Economics

Some commenters were concerned that the Project should provide jobs for the local economy. Other commenters suggested that planning and implementation costs should be reduced by managing on a large scale.

The IDT considered the entire Clear Creek watershed during the pre-NEPA assessment phase and when developing the Proposed Action. Timber harvested under any of the action alternatives would meet the goals and objectives of the Forest Plan to provide a sustained yield of resource outputs. Timber outputs from the Proposed Action would be used to offset treatment costs and support the economic structure of local communities and would provide for regional and national needs. Many of the stands proposed for treatment are currently losing volume and value due to insects and diseases. Harvesting the timber would provide materials for local industries.

ISSUE INDICATORS

- Timber harvest–related jobs and income
- Sale feasibility

1.7.1.6 Road Densities

Some commenters were concerned about the total road mileages and road densities in the Clear Creek watershed.

No permanent road construction is proposed under any alternative.

Alternative D was developed to address these concerns by minimizing the amount of temporary road construction. New temporary road construction would be minimized by using existing road templates as much as possible. Units would be harvested as described for Alternative B; some units would be dropped if they were not accessible by the more limited road system proposed for Alternative D.

ISSUE INDICATORS

- Riparian Habitat Conservation Area (RHCA) road densities
- Number of undersized culverts replaced and cross drains added
- Reduction in watershed road miles

1.7.1.7 Elk Security Habitat

Some commenters were concerned about the effects of the road network on elk security habitat.

No permanent road construction is proposed under any alternative. Alternative D was developed to address these concerns by minimizing the amount of temporary road construction.

The road system in the Clear Creek watershed has already been substantially reduced. The South Fork–West Fork Clear Creek Road Decommissioning DN/FONSI (2011) decommissioned 85 miles of roads. Temporary roads constructed for the Project would be decommissioned and recontoured after use.

ISSUE INDICATORS

- Percent of each Elk Analysis Area qualifying as secure habitat
- Elk Habitat Effectiveness Areas meeting Forest Plan standards using Leege (1984)

1.7.2 Concerns Raised in Response to Scoping

The Responsible Official reviewed the concerns below that were raised during the scoping. These concerns are valuable, but they do not raise unresolved conflicts with the Proposed Action and therefore are not treated as issues. Typically, these concerns have been addressed by incorporating additional design features

1.7.2.1 Collaborative Forest Landscape Restoration Plan Consistency

Because the project proposal is based on the CBC's Collaborative Forest Landscape Restoration Plan (CFLRP) proposal, some commenters were concerned that the project should be consistent with the requirements of the Collaborative Forest Landscape Restoration Act (CFLRA).

Project implementation will be consistent with requirements of the CFLRA, as well as all Nez Perce Forest Plan standards and other laws and regulations. The expenditure of CFLRA funds that will be used to implement and monitor this project will be reviewed for consistency by the CFLRP strategy group, composed of Forest Service and CBC members.

The EIS will analyze potential effects on old growth. The CFLRA requires that landscape restoration strategies "contribute to the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions of the forest type...", which will be accomplished through project design, unit delineations, silvicultural prescriptions, and marking guidelines. The current, best available science will be used, as required by NEPA and CFLRA.

The CFLRA does not allow the construction of permanent roads, thus, permanent road construction is not proposed for this Project. Any new temporary roads constructed will be decommissioned after use.

1.7.2.2 Old Growth

Some commenters asked that the IDT develop an alternative that would not harvest any old growth meeting Nez Perce Forest Plan or Green et al. (1992, errata corrected 2005, 2007, 2008, 2011) old growth criteria. Other commenters suggested that treatments in old growth stands should be considered if they would improve old growth habitat.

No old growth would be harvested under any alternative, although improvement cuts would be conducted in some stands over 150 years old that do not have old growth characteristics to help keep them on the landscape longer. Appendix D describes a site-specific Forest Plan amendment common to all action alternatives in this FEIS that clarifies the definition of old growth found in Appendix N of the Nez Perce Forest Plan.

Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest to maintain or improve the vigor/resiliency of preferred trees.

Improvement harvest in stands over 150 years old that do not have old growth characteristics would not change old-growth status per Green et al. (1992 as amended) old growth criteria. This "fully maintains, or contributes toward the restoration of, the structure and composition of old growth stands…" per PL 111-11 Title IV (2009).

1.8 Regulatory Requirements and Required Coordination

As part of the analysis for this project, the IDT evaluated various alternatives under the laws, regulations, and requirements relating to federal natural resource management. Several of the design features presented in Chapter 2 were developed and incorporated to ensure these requirements would be met. The following sections summarize the results of the analysis for those concerns most often noted. Additional details can be found in Chapters 2, 3, and/or the Project Record.

1.8.1 Forest Plan Direction

Although the Clearwater and Nez Perce National Forests were administratively combined in February 2013, management of the lands formerly within the boundary of the Nez Perce National Forest will continue to be guided by direction found in the Nez Perce Forest Plan until the plan is revised. The Nez Perce Forest Plan (USDA Forest Service 1987a, as amended) includes goals, objectives, standards, and guidelines that direct management of forest resources. Forest Plan direction is established at 2 scales: Forest-wide direction is applicable throughout the Forest and management area direction ties specific goals, objectives, and standards to the unique capabilities of given parcels of land.

Nez Perce Forest Plan standards apply to NFS lands within the Nez Perce National Forest boundary. They are intended to supplement, not replace, National and Regional policies, standards, and guidelines found in Forest Service Manuals (FSM) and Handbooks.

The project analysis was guided by the goals, objectives, standards, guidelines, and management area direction within the Nez Perce Forest Plan. This Project would help move the Forest toward desired conditions as described in the Forest Plan and other relevant planning direction.

1.8.2 Clean Air Act

The Clean Air Act, passed in 1963 and amended numerous times since then, is the primary legal authority governing air quality management. This Act provides the framework for national, State, and local efforts to protect air quality. The Montana/Idaho State Airshed Group was formed to coordinate all prescribed burning activities in order to minimize or prevent impacts from smoke emissions and ensure compliance with the National Ambient Air Quality Standards (NAAQS) issued by the Environmental Protection Agency (EPA), the federal agency charged with enforcing the Clean Air Act. The Forest Service, including the Moose Creek Ranger District, is a member of this Airshed Group. The Project area is in North Idaho Airshed Unit 12A. All post-harvest site preparation and prescribed fire treatments would be conducted according to the requirements of the Montana/North Idaho Smoke Management Unit guidelines.

1.8.3 Clean Water Act

Section 313 of the Clean Water Act requires federal agencies to comply with all federal, State, interstate, and local requirements; administrative authorities; and process and sanctions with respect to control and abatement of water pollution. Executive Order (EO) 12088 requires the Forest Service to meet the requirements of this Act. Therefore, all State and federal laws and regulations applicable to water quality would be applied, including 36 CFR 219.27; the Clean Water Act; EOs 11988 and 11990; Idaho Water Quality Standards; the Nez Perce Forest Plan, including PACFISH Riparian Management Objectives (RMOs) and RHCA buffers; Idaho State Best Management Practices (BMPs); Idaho Forest Practices Act, and Idaho Stream Channel Protection Act.

1.8.4 Region 1 Soil Quality Standards

Region 1 soil quality standards (USDA Forest Service 2014) specify that at least 85% of an activity area (defined as a land area affected by a management activity) must have soil that is in satisfactory condition. In other words, detrimental impacts (including compaction, displacement, rutting, severe burning, surface erosion, and mass wasting) shall be less than 15% of an activity area. In areas where more than 15% detrimental soil conditions exist from prior activities, the cumulative detrimental effects from proposed activities, including restoration, shall not exceed the conditions prior to the proposed activity and should move toward a net improvement in soil quality. Project design criteria were developed to better meet soil quality standards.

Appendix C describes in detail a site-specific, nonsignificant Forest Plan amendment adopting Region 1 soils standards that would be included in all action alternatives in the FEIS. A Forest Plan Amendment is needed because the Regional and Forest Plan Standards are different with regards to extent of disturbance area:

- The Nez Perce National Forest Plan soil standard #2 states: “A minimum of 80% of an activity area shall not be detrimentally compacted, displaced, or puddled upon completion of activities.” Once the unit exceeds the 20% disturbance threshold, no further entry is allowed.
- The Regional Standard limits disturbance to 15%, but allows entry into units that already exceed the 15% standard as long as the treatment and soil restoration shows an improvement of soil quality at the end of activities.

Therefore, in order to enter these units that currently exceed the Regional and Forest Plan Standard, we must amend the Forest Plan to allow for entry and show improvement to the soil resource by the activities.

1.8.5 The National Fire Plan and the Healthy Forest Restoration Act

The National Fire Plan (NFP) was developed in August 2000 following a landmark wildfire season with the intent of actively responding to severe wildland fires and their impacts to communities while ensuring sufficient firefighting capabilities. The NFP addresses 5 key points: firefighting, rehabilitation, hazardous fuels reduction, community assistance, and accountability. With regard to jurisdiction, direction in the NFP allows for the Forest Service to take NFP action on NFS lands, and for States to take and coordinate action on State and private lands. The Healthy Forests Restoration Act of 2003 (HFRA) (P.L. 108-148) contains a variety of provisions to address hazardous fuel reduction and forest restoration projects on specific types of federal lands that are at risk of wildland fire and/or insect and disease epidemics. The HFRA helps all landowners and managers restore healthy forest and rangeland conditions on those lands, regardless of ownership.

Both the NFP and HFRA provide overarching direction to reduce the threat of wildfire and restore ecosystems. Management actions proposed within the Project area are designed to be consistent with this direction. Particularly, proposed management activities would trend the general landscape condition toward desired fuel profiles and would optimize opportunities to treat hazardous fuels in identified Wildland-Urban Interface (WUI) lands and across the project area landscape.

1.8.6 Endangered Species Act

FSM 2670 directs the Forest Service to conserve endangered and threatened species and to utilize its authorities in furtherance of the Endangered Species Act (ESA), and to avoid actions that may cause a species to become threatened or endangered. FSM 2670 also requires the Forest Service to maintain viable populations of all native and desirable non-native wildlife, fish, and plant species in habitats distributed throughout their geographic range on NFS lands. As directed by the ESA, biological assessments and consultation under section 7 of the ESA will be completed for this decision. The action alternatives are not expected to result in a jeopardy biological opinion for any listed species.

1.8.7 Executive Orders 11988 and 11990

These federal Executive Orders (EOs) provide for the protection and management of floodplains and wetlands. Numerous floodplains and wetlands exist within the analysis area. Clear Creek Integrated Restoration project activities have been designed to be consistent with the requirements of EO 11988 and EO 11990. EO 11988 (Floodplain Management) requires federal agencies to evaluate the potential effects of actions it may take in a floodplain to avoid adversely impacting floodplains wherever possible, to ensure that its planning programs and budget requests reflect consideration of flood hazards and floodplain management, including restoring and preserving such land areas as natural undeveloped floodplains, and to prescribe procedures to implement the policies and procedures of this EO.

EO 11990 (Protection of Wetlands) requires federal agencies to take action to avoid adversely impacting wetlands wherever possible, to minimize wetlands destruction and preserve the values of wetlands, and to prescribe procedures to implement the policies and procedures of this EO.

1.8.8 Executive Order 12898

EO 12898 (Environmental Justice) directs each federal agency to make environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority and low-income populations. An associated memorandum emphasizes the need to consider these types of effects during NEPA analysis. The Proposed Action and alternatives would not disproportionately adversely affect minority or low-income populations, including American Indian tribal members.

1.8.9 Executive Order 13112

EO 13112 (Invasive Species) was issued on February 3, 1999, to enhance federal coordination and response to the complex and accelerating problem of invasive species. EO 13112 directs federal agencies to work together [as stated in the Preamble] to "…prevent the introduction of invasive species and provide for their control and to minimize the economic, ecological, and human health impacts that invasive species cause." Project activities have been designed to be consistent with the requirements of EO 13112.

1.8.10 Idaho Forest Practices Act

The Idaho Forest Practices Act regulates forest practices on all land ownership in Idaho. Forest practices on NFS lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). The rules are also incorporated as BMPs in the Idaho Water Quality Standards. Project activities have been designed to be consistent with the Idaho Forest Practices Act.

1.8.11 Idaho Roadless Rule

The Idaho Roadless Rule, promulgated on October 16, 2008 (73 FR 61456), identified a system of lands called "Idaho Roadless Areas" and established 5 management themes. These 5 themes protect roadless areas and their important characteristics by assigning various permissions and prohibitions regarding road building, timber cutting, and discretionary mineral activities. The final Rule also allows the Forest Service to reduce the risk of wildland fires to at-risk communities and municipal water supply systems. The final Rule supersedes the 2001 Roadless Area Conservation Rule for NFS lands in the State of Idaho. Project activities have been designed to be consistent with the Idaho Roadless Rule. The State of Idaho, Idaho Roadless Commission reviewed the Clear Creek Integrated Restoration Project's proposed activities on March 14, 2013.

1.8.12 Idaho Stream Channel Protection Act

The Idaho Stream Channel Protection Act regulates stream channel alterations between mean and high water marks on perennial streams in Idaho (IDAPA 37.03.07). Instream activities on NFS lands must adhere to the rules pertaining to the Act. The rules are also incorporated as BMPs in the Idaho Water Quality Standards. Project activities have been designed to be consistent with the Idaho Stream Channel Protection Act.

1.8.13 National Environmental Policy Act, Sections 101 and 106

The National Environmental Policy Act (NEPA) (42 U.S.C. 4321 et seq.) was signed into law on January 1, 1970. NEPA establishes national environmental policy and goals for the protection, maintenance, and enhancement of the environment and provides a process for implementing these goals within the federal agencies. NEPA also established the CEQ.

Title I of NEPA contains a Declaration of National Environmental Policy that requires the federal government to use all practicable means to create and maintain conditions under which man and nature can exist in productive harmony. Section 102 requires federal agencies to incorporate environmental considerations in their planning and decision-making through a systematic interdisciplinary approach. Specifically, all federal agencies are to prepare detailed statements assessing the environmental impact of and alternatives to major federal actions significantly affecting the environment. These statements are commonly referred to as environmental impact statements (EISs).

The public has an important role in the NEPA process, particularly during scoping, to provide input on what issues should be addressed in an EIS and to comment on the findings in an agency's NEPA documents. The public can participate in the NEPA process by attending NEPA-related hearings or public meetings and by submitting comments directly to the lead agency. The lead agency must consider all comments received from the public and other parties on NEPA documents during the comment period.

1.8.14 National Forest Management Act

The National Forest Management Act (NFMA) (16 U.S.C. 1600–1614, August 1974, as amended 1976, 1978, 1980, 1981, 1983, 1985, and 1990) reorganized, expanded, and otherwise amended the Forest and Rangeland Renewable Resources Planning Act of 1974, which called for the management of renewable resources on NFS lands. NFMA requires the Secretary of Agriculture to assess forest lands; develop a management program based on multiple-use, sustained-yield principles; and implement a resource management plan for each unit of the NFS. It is the primary statute governing the administration of national forests. Project activities have been designed to be consistent with the NFMA.

1.8.15 National Historic Preservation Act

Section 101 of the National Environmental Policy Act requires federal agencies to preserve important historic, cultural, and natural aspects of our national heritage. The legal processes associated with the protection and preservation of these resources is outlined in the National Historic Preservation Act of 1966 (NHPA) (36 CFR 800) and subsequent amendments. Passed by Congress two years before NEPA, the NHPA sets forth a framework for determining if a project is an "undertaking" that has the potential to effect cultural resources. The implementing regulations also outline the processes for identifying, evaluating, assessing effects, and protecting such properties. The coordination or linkage between the Section 106 process of the NHPA and the mandate to preserve our national heritage under NEPA is well understood and is formally established in 36 CFR 800.3b and 800.8. The terminology of "…important historic, cultural, and natural aspects of our national heritage" found in NEPA includes those resources defined as "historic properties" under the NHPA (36 CFR 800.16(l)(1)). It is thus the Section 106 process that agencies utilize to consider, manage, and protect historic properties during the planning and implementing stages of federal projects. The Forest meets its responsibilities under NHPA through compliance with the terms of a Programmatic Agreement (PA) signed between Region 1, the Idaho State Historic Preservation Office, and the Advisory Council on Historic Preservation.

1.8.16 Tribal Treaty Rights

American Indian tribes are afforded special rights under various federal statutes: NHPA; NFMA; Archaeological Resources Protection Act of 1979 (ARPA) (43 CFR Part 7); Native American Graves Protection and Repatriation Act of 1990 (NAGPRA) (43 CFR Part 10); Religious Freedom Restoration Act of 1993 (P.L. 103141); and the American Indian Religious Freedom Act of 1978 (AIRFA). Federal guidelines direct federal agencies to consult with tribal representatives who may have concerns about federal actions that may affect religious practices, other traditional cultural uses, or cultural resource sites and remains associated with tribal ancestors. Any tribe whose aboriginal territory occurs within a project area is afforded the opportunity to voice concerns for issues governed by NHPA, NAGPRA, or AIRFA.

Federal responsibilities to consult with tribes are included in the NFMA; Interior Secretarial Order 3175 of 1993; and EOs 12875, 13007, 12866, and 13084. EO 12875 (Enhancing the Intergovernmental Partnership) calls for regular consultation with tribal governments. EO 13007 (Indian Sacred Sites) requires consultation with tribes and religious representatives on the access, use, and protection of sacred sites. EO 12866 (Regulatory Planning and Review) requires that federal agencies seek views of tribal officials before imposing regulatory requirements that might affect them. EO 13084 (Consultation and Coordination with Indian Tribal Governments) provides direction regarding consultation and coordination with tribes relative to fee waivers. EO 12898 (Environmental Justice) directs federal agencies to focus on the human health and environmental conditions in minority and low-income communities, especially in instances where decisions may adversely impact these populations (see "Executive Order 12898" above). NEPA regulations (40 CFR 1500–1508) invite tribes to participate in forest management projects and activities that may affect them.

Portions of the Forest are located within ceded lands of the Nez Perce Tribe. Ceded lands are federal lands on which the federal government recognizes that a tribe has certain inherent rights conferred by treaty. In Article 3 of the Nez Perce Treaty of 1855, the United States of America and the Nez Perce Tribe mutually agreed that the Nez Perce retain the following rights:

> …taking fish at all usual and accustomed places in common with citizens of the Territory [of Idaho]; and of creating temporary buildings for curing, together with the privilege of hunting, gathering roots and berries, and pasturing horses and cattle…

The Clear Creek Integrated Restoration project has been presented to the Nez Perce Tribe at quarterly staff-to-staff meetings since April 2012. The project was presented to the Nez Perce Tribal Executive Council (NPTEC) for formal consultation on February 24, 2015, and was discussed during a government-to-government meeting with Tribal representatives on May 21, 2015. The Regional Forester's May 28, 2015 objection response letter included instructions for updating the analysis in the FEIS. The updated analysis was discussed with Tribal representatives on July 9, 2015.

Chapter 2–Alternatives, Including the Proposed Action

2.1 Introduction

This chapter describes and compares the alternatives considered for the Clear Creek Integrated Restoration Project, including alternatives considered but eliminated from detailed study. Maps of each alternative considered are included in Appendix A. This section also presents the alternatives in comparative form, sharply defining the differences between each alternative and providing a clear basis for options available to the Responsible Official. Some of the information used to compare the alternatives is based on the design of each alternative (such as regenerating versus deferring stands that have root disease), and some of the information is based upon the environmental, social, and economic effects of implementing each alternative (such as building new temporary roads versus deferring treatment in inaccessible stands).

2.2 Alternatives Considered in Detail

The Forest Service developed the No Action Alternative (Alternative A), the Proposed Action as modified in response to scoping comments (Alternative B), and two additional action alternatives (Alternatives C and D) in response to issues raised by the public.

2.2.1 Actions Common to All Action Alternatives

The following actions would be included in all of the action alternatives.

- 1,887 acres of precommercial thinning, 41 acres of grass restoration, and 1,371 acres of prescribed fire
- 119.8 miles of system road reconstruction (Appendix B)
- 48.8 miles of system road reconditioning (Appendix B)
- 13.2 miles of system road decommissioning (Appendix B)
- A site-specific nonsignificant Forest Plan amendment adopting the Region 1 soil standard of 15% for detrimentally compacted, displaced, or puddled soils (Appendix C)
- A site-specific, nonsignificant Forest Plan amendment clarifying the Forest's interpretation of Appendix N of the Nez Perce Forest Plan (Appendix D)
- The Design Criteria described later in this chapter

2.2.2 Alternative A: No Action

Under the No Action alternative, current management plans would continue to guide management of the project area. No timber harvest, improvement cutting, temporary road construction, prescribed burning, grass restoration, road reconstruction, road reconditioning, or road decommissioning would be implemented to accomplish project goals.

2.2.3 Alternative B: Proposed Action (as Modified in Response to Scoping Comments)

This alternative was developed in response to comments about the Proposed Action that was presented for public scoping in January 2012 (see Chapter 1 for a detailed description of the Proposed Action that was used for scoping). Alternative B would move the project area toward the desired conditions identified for the project during the pre-NEPA phase.

During the pre-NEPA phase of project development, the IDT identified large polygons or patches within the Project area referred to as "Focus Areas." The Focus Areas were identified based on a need to promote similar age classes by connecting recently regenerated stands (preferably those regenerated within the last 20 years). The intent was to establish breaks in continuous fuels, favor areas with known or developing forest health issues, and target over-represented mid-seral and mature age classes. The IDT also attempted to delineate these areas with identifiable features, such as forest type breaks, topographic breaks, and administrative boundaries. The Focus Areas served as the basis for developing the proposed action. A new Focus Area, developed after the Proposed Action was presented for scoping, was added to all of the action alternatives. It includes about 420 acres of regeneration harvest and some commercial and precommercial thin units. This new Focus Area also includes 1.2 miles of temporary roads, some of which would be on existing templates.

Within the Focus Areas, stands identified for regeneration would be regenerated to improve patch sizes, increase the amount of early seral forest across the landscape, and allow replanting with a mix of species that would improve the long-term resilience of these stands. Healthy grand fir/Douglas-fir, ponderosa pine, and other early seral stands would be commercially thinned. If root disease were detected in younger Douglas-fir/grand fir stands proposed for commercial thinning, treatment of these stands would be **deferred**.

Outside of the Focus Areas, healthy grand fir/Douglas-fir, ponderosa pine, and other early seral stands would be commercially thinned. If root disease were detected in younger Douglas-fir/grand fir stands proposed for commercial thinning, treatment of these stands would be **deferred**.

Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest to maintain or improve the vigor/resiliency of preferred trees. Improvement harvest in stands over 150 years old that do not have old growth characteristics would not change old-growth status per Green et al. (1992 as amended) old growth criteria. This "fully maintains, or contributes toward the restoration of, the structure and composition of old growth stands…" per PL 111-11 Title IV (2009).

All prescribed fire treatments would occur within the Clear Creek Roadless Area.

Table 2-1 summarizes the activities to be undertaken under Alternative B, and Appendix A contains a map of the proposed activities.

Table 2-1. Alternative B Vegetation Treatment and Temporary Road Construction

Treatment	Amount
Precommercial thinning (acres)	1,887
Grass restoration (acres)	41
Prescribed fire (acres)	1,371
Regeneration, Including Site Preparation and Reforestation (acres)	2,609
Improvement (acres)	331
Commercial Thin (acres)	5,606
Road reconditioning (miles)	48.8
Road reconstruction (miles)	119.8
Temporary Roads on Existing Templates (miles)	8.7
Temporary Roads, New Construction (miles)	27.6
Road decommissioning (miles)	13.2

2.2.4 Alternative C: Maximal Species Conversion

This alternative would address vegetative restoration needs described in the purpose and need for action, but to a greater degree than Alternative B. Desired conditions developed for this project indicate that young forest, particularly the 0–10 year age class, is well below desired conditions. Alternative C would move the project area toward the desired conditions by regenerating as many stands as possible, while still meeting objectives for other resources. This alternative was developed in response to scoping comments about the following resource concerns:

- Patch size and fragmentation
- Improvement of the distribution of foraging habitat relative to hiding cover
- Increase in the amount of early successional stands and wildlife foraging habitats
- Forest structure
- Economics
- Increase in stand mortality, by spreading root disease by commercially thinning stands infected
- Increase distribution of early seral species across the landscape

Alternative C would include 3,366 acres of commercial thin outside of the original Focus Areas.

Within the Focus Areas, stands identified for regeneration would be regenerated to improve patch sizes, increase the amount of early seral forest across the landscape, and allow replanting with a mix of species that would improve the long-term resilience of these stands. Stands proposed for commercial thinning that are not comprised of early seral species would be **regenerated**. Forest Service Handbook (FSH) 2409.17 allows the Forest Service to regenerate young stands based on specific ecological, resource, and management criteria to meet the purpose and need of a specific project.

Outside of the Focus Areas, healthy grand fir/Douglas-fir, pine, and other early seral stands would be commercially thinned. If root disease were detected in younger

Douglas-fir/grand fir stands proposed for commercial thinning, treatment of these stands would be **deferred**.

Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest to maintain or improve the vigor/resiliency of preferred trees. Improvement harvest in stands over 150 years old that do not have old growth characteristics would not change old-growth status per Green et al. (1992 as amended) old growth criteria. This "fully maintains, or contributes toward the restoration of, the structure and composition of old growth stands…" per PL 111-11 Title IV (2009).

Table 2-2 summarizes the activities to be undertaken under Alternative C, and Appendix A contains a map that displays the proposed activities.

Table 2-2. Alternative C Vegetation Treatment and Temporary Road Construction

Treatment	Amount
Precommercial thinning (acres)	1,
Grass restoration (acres)	41
Prescribed fire (acres)	1,371
Regeneration, Including Site Preparation and Reforestation (acres)	4,156
Improvement (acres)	331
Commercial Thin (acres)	4,220
Road reconstruction (miles)	119.8
Road reconditioning (miles)	48.8
Temporary Roads on Existing Templates (miles)	8.7
Temporary Roads, New Construction (miles)	27.6
Road decommissioning (miles)	13.2

2.2.5 Alternative D: Minimal Temporary Road Construction

Alternative D would address the need for vegetative rehabilitation in the Clear Creek watershed, but to a lesser degree than Alternative B. This alternative would use existing road templates as much as possible. It was developed in response to scoping comments about the following resource concerns:

- Road densities/cumulative impacts of past management
- Sediment input to stream channels
- Cumulative impacts of past timber harvest and road building on fisheries habitat, water quality, and soil productivity
- Effects of the road network on elk security habitat
- Meeting desired conditions for watersheds, fish, and wildlife habitats

A total of 8.7 miles of previously decommissioned roads that have existing templates (were not physically obliterated) would be reopened and 8.8 miles of new temporary roads would be constructed. Existing road templates were identified through photo interpretation, including aerial photos from 1970 and subsequent years, the LIDAR layer, and field reviews. The average length of new temporary road construction would be 375 feet; the average length of the existing template is 820 feet. New temporary construction would be added to the existing templates.

Units would be harvested as described for Alternative B, except that some units would be dropped if they were not accessible by the more limited road system proposed for Alternative D. Other units would utilize longer skidding or yarding distances where possible, along with skidding logs from skyline landings down shorter skid trails to truck loading sites, instead of building roads to the skyline landing.

Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest to maintain or improve the vigor/resiliency of preferred trees. Improvement harvest in stands over 150 years old that do not have old growth characteristics would not change old-growth status per Green et al. (1992 as amended) old growth criteria. This "fully maintains, or contributes toward the restoration of, the structure and composition of old growth stands…" per PL 111-11 Title IV (2009). Table 2-3 summarizes the activities to be undertaken under Alternative D, and Appendix A contains a map that displays the proposed activities.

Table 2-3. Alternative D Vegetation Treatment and Temporary Road Construction

Treatment	Amount
Precommercial thinning (acres)	1,887
Grass restoration (acres)	41
Prescribed fire (acres)	1,371
Regeneration, Including Site Preparation and Reforestation (acres)	2,178
Improvement (acres)	211
Commercial Thin (acres)	5,141
Road reconstruction (miles)	119.8
Road reconditioning (miles)	48.8
Temporary Roads on Existing Templates (miles)	8.7
Temporary Roads, New Construction (miles)	8.8
Road decommissioning (miles)	13.2

2.2.6 Design Criteria

The following design criteria would be included as actions common to all action alternatives.

2.2.6.1 Soils

Effectiveness of design features are moderate to high based on past monitoring and research (Froehlich and McNabb 1983; Graham et al. 1994; Graham et al. 1999; Korb et al. 2004; Neary et al. 2008; Curran et al. 2005a,b). Appendix E displays cause for design criteria for each harvest unit, including landslide prone, temporary road, Regional 15% DSD standard, subsurface erosion hazard, and down wood material.

1) When machine piling, existing duff/litter would be retained (as much as possible and not included in the activity slash piling. No material greater than 4 inches would be added to slash piles.

2) Skid trails, landings, and yarding corridors would be located and designated to minimize the area of increased detrimental soil effects. This would not preclude the use of feller bunchers off skid trails if soil impacts can remain within standards. Winter logging could be utilized in the implementation of this project, as long as frozen ground or depths of snow conditions are met but would not be required.
3) Landslide prone areas have been mapped and field verified in the harvest units. These landslide prone areas would be further delineated in the field, would be excluded during unit layout, and would receive a PACFISH buffer. Indicators of landslide prone areas include: steep (over 60%) concave slopes; hydrophytic vegetation (i.e. sedges, moist site ferns); slumps, draws, and basins; past landslide locations; and obvious soil movement areas (typically indicated by curved and/or buttressed tree boles, soil creep, tension cracks, etc.). No harvest activities would occur in these areas.
4) For prescribed fire units, there would be no fire ignition in GIS mapped landslide prone areas (following PACFISH guidelines). Fire would be allowed to back through these areas.
5) For units with high subsurface erosion potential, the amount of excavated skid trails and landings would be limited to the extent possible, and all excavated skid trails and landings on these landtypes would be decommissioned (full recontour) and large woody material would be placed over the slope for soil stabilization. While in use or over-wintering, an increased number of water bars or addition of slash material to road bed would be used as necessary to reduce erosion.
6) For all Units including those designated in the reuse, trending positive, and Forest Plan amendment design categories (see section 3.8.6): A logging system layout design would be developed to use as many of the existing skid trails and landings as possible and limit the amount of new detrimental disturbance. All skid trails and landings used would be decommissioned after use. Actions would include scarifying/decompacting soils and placement of slash, woody material, and/or duff over exposed soil. Equipment used for machine piling or mastication of activity slash would remain on designated skid trail or would be required to rehabilitate (decompact or recontour) any detrimental disturbance they cause.
7) For Units designated in the special design category (see section 3.8.6), special attention would be needed for these units to remain at or below 15% Detrimental Soil Disturbance (DSD) following project implementation. Methods to ensure this might include locating main skid trails only on existing disturbed areas, with few “one-pass” trails occurring on undisturbed ground; using a cut-to-length forwarder system; requiring equipment used for machine piling or mastication of activity slash to remain on designated skid trails; and developing a logging system layout design that limits the amount of new detrimental disturbance. Portions of the unit could be dropped if the layout plan cannot reach the entire unit while staying under the 15% standard. The estimated amount of acres of new disturbance has been calculated for each unit and can be found in the project file. In addition, all skid trails and landings and temporary roads (see item 10 for

temporary road decommissioning) would be decommissioned (includes soil decompaction).

8) For all harvest units, decompaction would be required on skid trails where excavation or ground disturbance has occurred or where successive passes have taken place over the same trail. Decompaction would be conducted to improve soil productivity and meet Regional soil quality standards. Decompaction would span the width of the compacted areas and extend to a depth of 10–18 inches, to effectively loosen the ground to allow water penetration and revegetation and to prevent the rocky sub-surface soils from mixing with the topsoil. The depth of decompaction should be adjusted to avoid turning up large rocks, roots, or stumps. Equipment would not be permitted to operate outside the clearing limits of the skid trail. Decompaction should be done from June 15 to October 15, unless otherwise approved. No decompaction work should be done during wet weather or when the ground is frozen or otherwise unsuitable.
9) In all units, to reduce ground disturbance, no ground based skidding would be allowed on slopes over 35%, unless operating on adequately compacted snow or only over short distances.
10) All temporary roads would be decommissioned (all new construction would be decompacted and recontoured; existing prisms would be placed in a stable condition through decompaction). Cut/fill slopes and crossings would be reshaped to natural contours. Available slash and large wood material (>3 inches) would be applied to the recontour surface (slash is considered "available" where the equipment can reach it from the working area where the decommissioning is occurring). Temporary road rehabilitation work shall begin as soon as possible after the timber harvest operations have been completed. They are not intended to be left open for post –harvest treatment activities, such as site preparation burning or planting.
11) Activities would be restricted when soils are wet to prevent resource damage (indicators include excessive rutting, soil displacement, and erosion).
12) For all harvest units, coarse woody material appropriate to the site would be retained for maintaining soil moisture, soil stability, and other soil physical and biological properties after all unit activities. Regional guidance for organic matter recommends the following guidelines, such as retaining coarse (> 3 inches diameter) woody material to maintain soil productivity (Graham et al. 1994). Drier habitat types have wood retention requirements of 7–15 tons/acre for Douglas-fir, grand fir, and ponderosa pine types. Moister habitat types require 17–33 tons/acre. Approximately 14–28 standing trees would be retained for future down wood recruitment. Retention levels on the higher end of the range would be used for proposed regeneration harvest units 107, 117, 142, and 148, because of low existing woody material. Snags or other designated retention trees felled for safety reasons would be left in the unit.
13) Burning of activity generated slash would be designed in the project burn plan to provide a low-severity mosaic burn that has been shown to cause little-to-no detrimental disturbance of soil resources (Neary et al. 2008).

14) Twenty-five harvest and burn units would be monitored 1 to 3 years after treatment to determine extent of detrimental soil disturbance and effectiveness of skid trail and temporary road decommissioning.

Table 2-4 displays the Soil and Water Conservation Practices (FSH 2509.22) that will also be incorporated as design criteria. These are also referred to as Best Management Practices (BMPs) throughout the document.

Table 2-4. Soil and Water Conservation Practices (FSH 2509.22)

Category	Number	Description
11 Watershed Management	W11.05	Wetlands Analysis and Evaluation
	W11.07	Oil and Hazardous Substance Spill Contingency Planning
	W11.11	Petroleum Storage and Deliver Facilities and Management
	W11.13	Sanitary Guidelines for Construction of Temporary Logging Camps
13 Vegetation Manipulation	G13.02	Slope Limitations for Tractor Operation
	G13.03	Tractor Operation Excluded from Wetlands, Bogs, and Wet Meadows
	E13.04	Revegetation of Surface Disturbed Areas
	E13.06	Soil Moisture Limitations for Tractor Operation
14 Timber	A14.02	Timber Harvest Unit Design
	A14.03	Use of Sale Area Maps for Designating Soil and Water Protection Needs
	A14.04	Limiting the Operating Period of Timber Sale Activities
	A14.05	Protection of Unstable Areas
	A14.06	Riparian Area Designation
	E14.07	Determining Tractor Loggable Ground
	E14.08	Tractor Skidding Design
	E14.09	Suspended Log Yarding in Timber Harvesting
	A14.10	Log Landing Location and Design
	E14.11	Log Landing Erosion Prevention and Control
	E14.12	Erosion Prevention and Control Measures During Timber Sale Operations
	E14.14	Revegetation of Areas Disturbed by Harvest Activities
	E14.15	Erosion Control on Skid Trails
	E14.16	Meadow Protection During Timber Harvesting
	E14.17	Stream Channel Protection
	E14.18	Erosion Control Structure Maintenance
	A14.19	Acceptance of Timber Sale Erosion Control Measures Before Sale Closure
	A14.22	Modification of the Timber Sale Contract

Category	Number	Description
15 Roads and Trails	E15.03	Road and Trail Erosion Control Plan
	E15.04	Timing of Construction Activities
	E15.05	Slope Stabilization and Prevention of Mass Failures
	E15.06	Mitigation of Surface Erosion and Stabilization of Slopes
	E15.07	Control of Permanent Road Drainage
	E15.10	Control of Road Construction Excavation and Sidecast Material
	S15.11	Servicing and Refueling of Equipment
	S15.12	Control of Construction In Riparian Areas
	S15.19	Streambank Protection
	E15.21	Maintenance of Roads
	E15.22	Road Surface Treatment to Prevent Loss of Materials
	E15.24	Snow Removal Controls
	E15.25	Obliteration of Temporary Roads
18 Fuels Management	E18.02	Formulation of Fire Prescriptions
	E18.03	Protection of Soil and Water from Prescribed Burning Effects

Note: Classes of Soil and Water Conservation Practices (BMP): A = Administrative, G = Ground Disturbance Reduction, S = Stream Channel Protection and Sediment Reduction, E = Erosion Reduction, and W = Water Quality Protection

2.2.6.2 Wildlife

1) All temporary roads would be closed to the public and decommissioned following use.
2) Stands over 150 years old that do not have old growth characteristics may be treated with improvement harvest to maintain or improve the vigor/resiliency of preferred trees. Improvement harvest in Stands over 150 years old that do not have old growth characteristics would not change old-growth status per Green et al. (1992 as amended) old growth criteria. This "fully maintains, or contributes toward the restoration of, the structure and composition of old growth stands…" per PL 111-11 Title IV (2009).
3) Large snags would be retained. Each post-treated area, on average, would comply with mean snag retention values displayed in Table 12 of *Estimates of Snag Densities for Northern Idaho Forests in the Northern Region* (Bollenbacher et al. 2009) for low and mid elevation moist habitat types in early seral conditions (at least 6 snags per). Preferred species (ponderosa pine, western larch, Douglas-fir) of large, legacy snags would be selected for retention. Alternate tree species would be retained where preferred species do not exist in quantities to meet Regional guidance. Large snags would be retained with green trees in groups of 7–10 trees or larger retention patches. Preference would be given to the largest available snags or damaged trees, generally greater than 21 inches in diameter and greater than 40 feet tall. A combination of clumps (groups of live and dead trees) and lone snags that have little potential to cause safety issues would be retained. Snag retention within one tree length of open motorized roads would be avoided. Snag or live retention trees felled for safety purposes would be left on site or traded with a comparable tree.

4) In treatment areas, all legacy trees (large diameter trees that survived the last stand replacing event) would be retained. In Clear Creek, these trees frequently are over 30 inches dbh. Legacy trees may be unevenly distributed and retained in clumps as well as individual trees. This design measure allows hazardous fuels reduction while "…maximizing the retention of large trees, as appropriate for the forest type…" per PL 111-11 Title IV (2009).
5) Green tree retention in all regeneration and improvement harvest areas would consist of an average of 14–28 of the largest trees per acre (generally over 21 inches dbh) distributed in clumps (7–10+ trees plus snags) and individuals, with no area greater than 2 acres without retained trees. Tree retention would focus on ponderosa pine, western larch, and healthy Douglas-fir, and large tree retention would be maximized, as appropriate for the forest type per PL 111-11 Title IV (2009).
6) *Regeneration Harvest Leave Tree Survival:* The Clear Creek project would strive for a variable tree survival objective for the project as a whole, with the objective of having almost all legacy trees (large diameter trees that survived the last stand replacing fire) survive the prescribed burns. See Target Stand discussion in Chapter 3 vegetation analysis. Fuel reduction measures (limb/top removal or slash reduction around these trees) would be implemented where needed to ensure tree survival for the legacy larch, ponderosa pine, and Douglas-fir. For the non-legacy trees, the objective would be for a majority (>50%) of the leave trees to survive the prescribed burn. Prescribed fire might be allowed to back into RHCAs and retained clumps; however, no ignitions would be allowed within them. These measures allow hazardous fuel reduction while "…maximizing the retention of large trees, as appropriate for the forest type…" per PL 111-11 Title IV (2009).
7) Maintain a minimum 40-acre yearlong no-treatment buffer around occupied goshawk nest trees. No ground disturbing activities would be allowed inside occupied post-fledgling goshawk areas (300–600 acres around the nest stand) from April 15 to August 15.
8) If a den, nest sites, or other important habitat feature of any threatened, endangered, or sensitive species were to be discovered within or in close proximity to any treatment unit, project activities would be coordinated with a wildlife biologist so that appropriate conservation measures could be developed.
9) Invasive plants displace indigenous plants that provide forage or cover for wildlife. The spread of noxious weeds and invasive plants would be minimized by chemically treating any noxious weed populations along the existing road systems before and after project implementation; monitoring and cleaning any equipment of loose debris prior entering the Project area to prevent "new invader" weed establishment; and revegetating project-related exposed soils (i.e., landings, skid trails, road sides, etc.) using certified noxious weed free native seed mix and fertilizer (as necessary) upon project completion. All seeding would follow Region 1 guidelines.
10) In moose winter range (MA 21), silvicultural prescriptions that comply with Forest Plan standards would be developed for commercial thin and regeneration

harvest areas and incorporated into marking or layout guidelines. The Forest Plan identifies the following guidelines: a) For those lands that are scheduled for harvest, harvest a maximum of 5% of Pacific yew stands per decade on a 210-year rotation, b) Maintain at least 50% of the live Pacific yew components scattered throughout the unit in patches 1/4 to 1/2 acre in size, c) The preferred harvest type includes patch clearcuts, individual tree selection, group selection, or shelterwood. Patch clearcuts should be no larger than 20 acres in size (5–10 acres preferred), d) Maintain leave-strips between yew stands sufficient to provide travel corridors for moose, and e) Reforest to desired stocking levels either through planting or through natural regeneration to achieve 30% crown closure over 20 years for conifers, and 30% crown closure over 20-30 years for Pacific yew. The following commercial thin units occur in MA 21: 228, 230, 231, 234, 238, 335, 349–351, and 356–358. The following regeneration harvest units occur in MA 21: 136–139, 145, and 146.

11) Retained large down logs would be evenly distributed in regeneration and improvement units to support small animal habitats.
12) Landscape burning prescriptions, especially in MA 16 (winter range), would be developed to maintain the duff layer to prevent invasive species germination. Burn units 701–715 occur in MA 16.
13) Regeneration harvest units that have a large component of yew in the understory would be marked to "clump" green tree retention around yew concentrations, where feasible and while still meeting silvicultural needs.
14) To support the availability, distribution, and sustainability of quality browse species (particularly redstem ceanothus, serviceberry, willow, and mountain maple), prescribed fire prescriptions would be developed for implementation during summer or fall. Spring burns would be appropriate only to prepare fuel breaks for summer/fall burns.

2.2.6.3 Aquatics

1) PACFISH default RHCAs would be used to define timber sale unit boundaries. No timber harvest would occur within 300 feet of fish-bearing streams, 150 feet of perennial non-fish bearing water, 100 feet of intermittent streams, and 150-foot slope distance from the edge of wetlands larger than one acre.
2) Prescribed fire would not be ignited in areas requiring 100% live canopy retention (RHCAs and landslide prone areas). The burn objective would be to prevent fire entry into these areas. Low-intensity fire may be allowed to back into the edges of some of these sensitive areas and would result in no less than 90% live-canopy retention for the area.
3) BMPs, as found in Rules Pertaining to the Idaho Forest Practices Act, would be applied to prevent non-channelized sediment delivery from harvest units to streams in the Project area.

4) Contractors would have spill prevention and containment materials available at the Lochsa Ranger District Office to minimize the risk of an accidental spill of petroleum products, as well as to protect water courses and aquatic biota from adverse effects in the event of a spill.
5) During road decommissioning or culvert replacements, measures to prevent damaging levels of sediment from entering streams would be undertaken, such as: (a) placing removable sediment traps below work areas to trap fines; (b) when working instream, removing all fill around pipes prior to bypass and pipe removal (where this is not possible, use non-eroding diversion); (c) revegetating scarified and disturbed soils with weed-free grasses for short-term erosion protection and with shrubs and trees for long-term soil stability; (d) utilizing erosion control mats on stream channel slopes and slides; (e) mulching with native materials, where available, or using weed-free straw to ensure coverage of exposed soils; (f) dissipating energy in the newly constructed stream channels using log or rock weirs; and (g) armoring channel banks and dissipating energy with large rock whenever possible.
6) Temporary roads would be constructed on or near ridge tops with no stream crossings. All temporary roads would be constructed and then obliterated within 2 years. Obliteration includes de-compaction, re-contouring where needed, and the application of woody material onto the de-compacted surface to provide for soil productivity and limit erosion potential.
7) Cross drain culverts would be installed near stream crossings in order to divert ditchline sediment away from stream crossings and onto the forest floor, and where needed to achieve spacing to reduce sediment delivery from road surfaces and ditches.
8) Reconstructed road segments would receive an application of surface aggregate to reduce current and future erosion, particularly at road/stream crossings.
9) Dust abatement would be used on major haul routes to minimize sediment input to streams from log hauling activities.
10) Instream work on 6 culvert replacements (3 sites on Upper Clear Creek and 3 on South Fork Clear Creek) would occur after July 15 to protect steelhead designated critical habitat downstream.

2.2.6.4 Heritage Resources

Table 2-5 describes mitigation measures/design criteria that would be implemented to protect Heritage Resources in the project area.

Table 2-5. Design Criteria that would be Implemented to Protect Heritage Resources in the Clear Creek Project Area

Site Number/Type[a]	Unit Number	Harvest Method	Design Criteria
10IH487 / Lithic Scatter	309	Commercial Thin	Avoid
10IH883 / Trail	230 354	Regeneration Commercial Thin	50 foot buffer 50 foot buffer
10IH1746 / Lithic Scatter	309	Commercial Thin	Avoid
10IH2164 / Lithic Scatter	307	Commercial Thin	Avoid
10IH3197 / Trail	301 306 307 316 318 319 373	Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin	50 foot buffer 50 foot buffer 50 foot buffer 50 foot buffer 50 foot buffer 50 foot buffer 50 foot buffer

[a]Site locations are protected by law (36 CFR 296.18), but will be communicated to project personnel to ensure protection.

2.2.6.5 Recreation

- Designated trails would be protected by showing them on the contract map as protected improvements. Following harvest activities, any impacted trail would be restored to a useable condition as it was prior to the activity taking place. One mile of Trail 723 occurs within a commercial thin unit, and the trail would be used as a temporary road. Light thinning would be done adjacent to the trail and the trail would be cleaned up and reestablished after harvest. No access would be allowed during prescribed burning, and hazardous trees within a tree length of the trail would be felled for public safety.
- No-harvest buffers would be implemented around dispersed camp sites, especially in Unit 123.

2.2.6.6 Visuals

Design features used to reduce the visual impact of the harvest areas include retention of vertical structure within the harvest units and edge treatment that emulates natural openings. Leave trees, that provide vertical structure within the harvest area, may be both live and dead trees emulating the same structure that would remain after a natural mixed severity wildfire. These leave areas would range from ¼ to 3 acres in size and may include leave areas adjacent to unit boundaries. Unit boundaries for units visible in the foreground would be shaped and feathered to reduce any unnaturally shaped edges and would reduce the hard edges that appear as a man-made features on the landscape.

2.3 ALTERNATIVES CONSIDERED BUT ELIMINATED FROM DETAILED STUDY

Federal agencies are required by NEPA to rigorously explore and objectively evaluate all reasonable alternatives and to briefly discuss the reasons for eliminating any alternatives that were not developed in detail (40 CFR 1502.14). Public comments received in response to the Proposed Action provided suggestions for alternative methods for achieving the purpose and need. Some of these alternatives would have modified the proposed action to the point where the purpose and need for action would not be met, would have been duplicative of the alternatives considered in detail, or were determined to be components that would cause unnecessary environmental harm. Therefore, a number of alternatives were considered, but dismissed from detailed consideration for reasons summarized below. See the “Issues” section in Chapter 1 for a more detailed discussion of the alternative-driving issues that were raised during scoping.

Old Growth: The IDT considered an alternative that would harvest old growth stands, but did not study it in detail, although improvement cuts would be done in some stands over 150 years old that do not have old growth characteristics to help keep them on the landscape longer. Although the amount of old growth in the project area exceeds the Forest Plan minimum standard, CFLRA goals and objectives require that large diameter trees be retained as much as possible to the extent they promote fire resiliency. Appendix D describes a site-specific Forest Plan amendment clarifying how Forest Plan standards for old growth would be interpreted for this project.

Watershed Rehabilitation (Road Decommissioning) Only; No Timber Harvest or Prescribed Burning: Some commenters asked that the IDT consider an alternative that would focus only on watershed rehabilitation activities, such as road decommissioning, with no timber harvest or prescribed burning.

The IDT analyzed this alternative, but did not study it in detail because it would not meet the purpose and need for this project. Also, in effect, this “alternative” was previously analyzed in the South Fork–West Fork Clear Creek Road Decommissioning Environmental Assessment (USDA Forest Service 2011), which decommissioned 10 miles of system roads and 75 miles of nonsystem roads in the Clear Creek watershed. An additional 13.2 miles of NFS road decommissioning are proposed for the Clear Creek Integrated Restoration Project as actions common to all alternatives. The future Clear Ridge Nonsystem Road Decommissioning project proposes to decommission 65 miles of nonsystem road in the northern portion of the Clear Creek watershed

Prescribed Burning-Only Alternative: The IDT analyzed an alternative that would use prescribed burning alone to manage vegetation, but did not study it in detail because it would not meet the purpose and need for this project, and because of economic concerns. Timber outputs from the proposed action would be used to offset treatment costs and support the economic structure of local communities and provide for regional and national needs. Also, burning commercial timber would not be consistent with the Forest Plan.

No Prescribed Burning: Some commenters asked that the IDT develop an alternative that would not include any prescribed burning.

The IDT analyzed this alternative, but did not study it in detail because prescribed burning is the only viable tool available to manage vegetation within the Clear Creek Roadless Area.

Prescribed fire is also an important and effective tool for reducing post activity fuels in treatment units as well as stimulating grass, forb, and shrub regrowth.

No Temporary Road Construction/Use Existing Roads Only/Helicopter Logging: Some commenters were concerned about existing road densities in the Clear Creek watershed and the effects of the road system on fisheries and wildlife habitat.

An alternative that would not build any temporary roads was considered but not analyzed in detail by the IDT because it would reduce the managed area to the point where the purpose and need to manage vegetation would not be met. The road system in the Clear Creek watershed has already been substantially reduced. The South Fork–West Fork Clear Creek Road Decommissioning DN/FONSI (2011) decommissioned 85 miles of system and nonsystem roads. Temporary roads constructed for the Clear Creek Integrated Restoration Project would be decommissioned and recontoured after use.

Watershed rehabilitation is better achieved by decommissioning old roads in poor locations (unstable, midslope or stream-adjacent). Building new temporary roads in more stable locations away from streams, and then recontouring them after use, creates less chance of erosion and subsequent sediment delivery. The IDT considered an alternative that would build temporary roads only on existing or former road templates. This alternative was not analyzed in detail because it would not provide enough access or access in the appropriate locations to meet the purpose and need to manage vegetation in the project area.

The IDT also considered an alternative that would use helicopter logging instead of building temporary roads. This alternative was not analyzed in detail because a timber sale based on helicopter logging alone would not be economically viable.

Do Not Use Vegetation Response Unit Desired Future Conditions Developed for this Project: Some commenters did not want the DFCs that were developed specifically for this Project to be used and asked that the IDT use Forest Plan goals and objectives alone to guide management activities.

The IDT considered this alternative, but did not analyze it in detail because project-specific desired conditions that were developed during the pre-NEPA stage of project were based on Forest Plan direction and refined by the best available science. Site-specific, VRU-based desired conditions that were based on Forest Plan goals, objectives, and standards, were used to develop the alternatives analyzed in detail.

Analyze an Alternative with Opening Sizes 40 Acres or Less: Some commenters were concerned that past management has reduced patch sizes and increased fragmentation in the Clear Creek watershed. Conversely, some commenters expressed concern about exceeding the 40-acre opening limitation.

In response to the expressed concerns, the interdisciplinary team considered an alternative that would not create openings greater than 40 acres; however, this alternative was eliminated from detailed consideration after an analysis of the effects on fragmentation and fire spread (Figure 2-1). An under-40-acre-alternative would not trend the area toward desired future conditions, and it would prevent treatment activities from meeting the purpose and need for the project.

There is also a need to trend the landscape toward a more desirable pattern of forest structure and patch sizes. The scale of treatments should be matched to the scale of the widespread and increasing root disease and bark beetle (Douglas-fir beetle, fir engraver beetle, and mountain pine beetle) mortality in order to restore resilient tree species. The large majority of the resource area is classified as mature forest (i.e., mature forest is the matrix). Previous regeneration harvesting created the majority of the existing openings within the resource area but left untreated, mature forested stands between and around the openings. Extensive areas of mature forest in the resource area have been severely affected by root disease and bark beetles.

Within the resource area there is currently very little diversity in patch sizes within the young structure class. Creating openings in excess of 40 acres would increase the diversity of patch sizes within the young structure class and eventually in the medium structure class as the young stands grow. This increased diversity in patch sizes would also translate to the long-lived early seral species forest cover types because most of these forest cover types are directly associated with regeneration harvests in the resource area. Developing large patches of resilient forest now may eventually lead to development of large patches of future old growth that have greater representation of resilient species.

The effects that an under-40-acre-alternative would have on patch sizes are displayed in Table 2-6. Although there is not a marked reduction in patch size, it does show that this alternative would continue to trend the resource area toward a fragmented landscape.

Table 2-6. Effects of Under-40-Acre-Alternative on Patch Sizes

Structural Class	Existing Condition		40 Acre and Less Alternative	
	% of Clear Creek Resource Area	Existing Mean Patch Size	% of Clear Creek Resource Area	Post-Treatment Mean Patch Size
Seral Shrub	7	179	7	177
Stand Initiation	17	48	17	47
Stem Exclusion	26	115	26	99
Understory Re-initiation	17	62	17	57
Young Multi-Story	3	27	3	24
Old Single-Story	17	77	17	72
Old Multi-Story	13	74	13	70

Similarly, there is a need to create a pattern of fuel treatments across the landscape that will effectively modify potential fire behavior and produce a safer environment in which to conduct suppression activities. Fire research results show that larger treatment blocks are more effective than scattered smaller treatment blocks at altering fire spread rates and severities within a given treatment block. Research also shows that strategic placement of treatment blocks is important to alter fire spread rates and severities across a given landscape. It is important to match the scale of treatments to the scale of the insect and disease-driven fuel accumulations, and to match the scale of historic ecological processes within the resource area to create “fences and corridors” on the landscape (McKenzie et al. 2011, Chapter 3). Limiting opening sizes to less than 40 acres would limit their effectiveness at slowing the spread of large fires, and would limit their effectiveness at reducing fire severity. Smaller fuel treatment areas would not have as many significant beneficial effects on the spread, intensity, and severity of large fires, especially if placed randomly on the landscape.

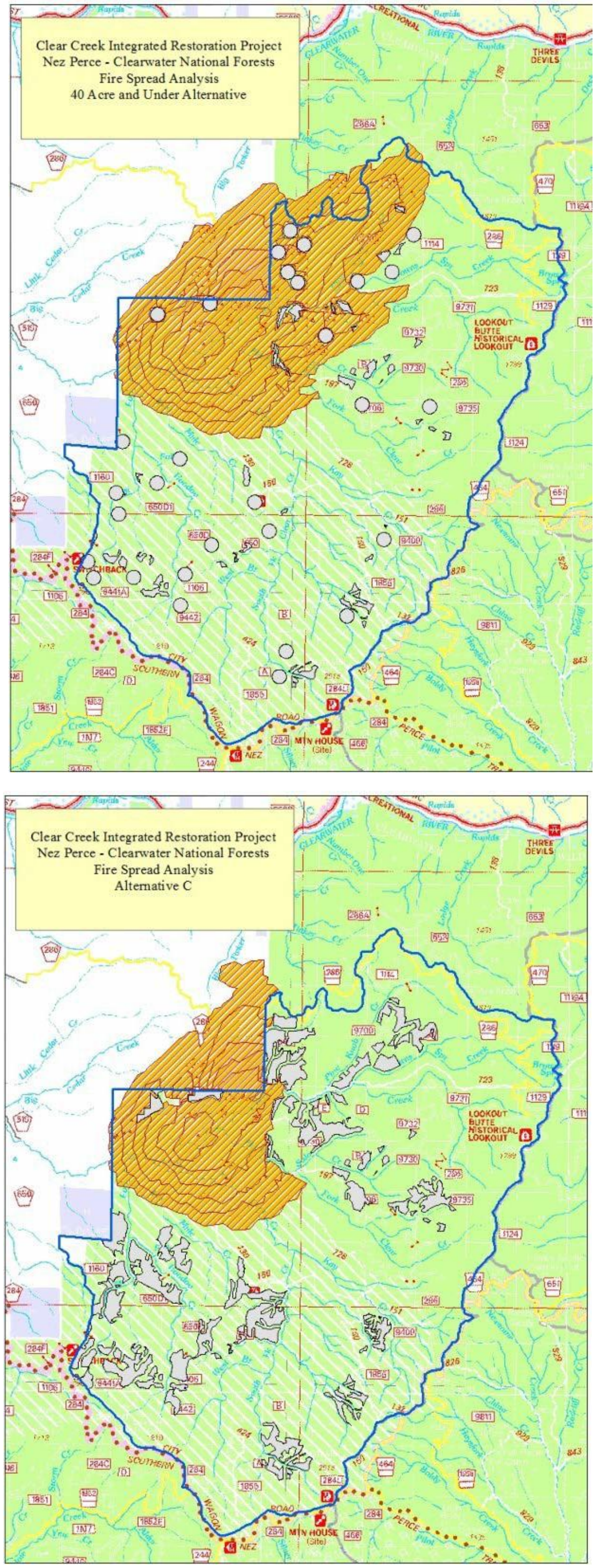


Figure 2-1. The estimated effects of an under-40-acre alternative on fire spread are displayed adjacent to the effects of fire spread in alternative C

2.4 COMPARISON OF ALTERNATIVES

This section provides a summary of the effects of implementing each alternative. Information in the Table 2-7 and Table 2-8 are focused on activities and effects where different levels of effects or outputs can be distinguished quantitatively or qualitatively among alternatives. Table 2-9 compares the alternatives by issue and resource indicators.

Table 2-7. Comparison of Alternatives (Alt.) by Activity

Activity	Alt. A (No Action)	Alt. B (Proposed Action)	Alt. C	Alt. D	Comments
Regeneration Harvest Acres Within Focus Areas	0	2,609	3,995	2,017	
Regeneration Harvest Acres Outside of Focus Areas	0	0	161	161	
Total Regeneration Harvest Acres	0	2,609	4,156	2,178	
Commercial Thin Acres Within Focus Areas	0	2,240	854	1,997	
Commercial Thin Acres Outside of Focus Areas	0	3,366	3,366	3,144	
Total Commercial Thin Acres	0	5,606	4,220	5,141	
Precommercial Thin Acres Within Focus Areas	0	904	998	998	
Precommercial Thin Acres Outside of Focus Areas	0	889	889	889	
Total Precommercial Thin Acres	0	1,793	1,887	1,887	Less acres due to precommercial thinning units dropped in Lynx Analysis Unit
Improvement Harvest Acres	0	331	331	211	
Restoration (Grass)	0	41	41	41	
Prescribed Fire Acres	0	1,371	1,371	1,371	
System Road Construction (miles)	0	0	0	0	
System Road Reconstruction (miles)	0	119.8	119.8	119.8	If reconstruction is proposed for any part of a road, the total mileage of the road is included.
System Road Reconditioning (miles)	0	48.8	48.8	48.8	If reconditioning is proposed for any part of a road, the total mileage of the road is included.
Temporary Roads—Existing Template (miles)	0	8.7	8.7	8.7	
Temporary Roads—New Construction (miles)		27.6	27.6	8.8	No new temp roads over 600 ft
System Road Decommissioning (miles)	0	13.2	13.2	13.2	

Activity	Alt. A (No Action)	Alt. B (Proposed Action)	Alt. C	Alt. D	Comments
Open Seasonally or Yearlong to Vehicles >50 inches wide (miles)	39.9	39.9	39.9	39.9	From DRAMVU Alt. 5
Open Seasonally or Yearlong to <50-inch motorized vehicles (miles)	26.1	26.1	26.1	26.1	From DRAMVU Alt. 5
Open Seasonally to Motorcycles (miles)	8.2	8.2	8.2	8.2	From DRAMVU Alt. 5
Forest Plan Amendment	0	1	1	1	Soils
Forest Plan Amendment	0	1	1	1	Old Growth
Site Preparation and Reforestation	0	2,609	3,995	2,017	Mechanical site prept for ground-based harvest; prescribed fire site prep for skyline harvest.

Table 2-8. Comparison of Purpose and Need by Alternative (Alt.) and Activity

Resource Indicator	Alt. A	Alt. B	Alt. C	Alt. D
Purpose and Need 1: Vegetation and Wildlife Habitat Improvement				
Forest structure consists of a range of age and size classes with species diversity that is resistant and resilient to change agents (insects, diseases, and wildfires)	No	Yes	Yes	Yes
Early seral species represent a greater percentage of species mix?	No	Yes	Yes	Yes
Purpose and Need 2: Goods and Services				
Sustained yield of resources outputs provided?	No	Yes	Yes	Yes
Purpose and Need 3: Watershed Improvement				
Road system maintained to provide for timber harvest, recreation, fire suppression, and administrative use?	Yes	Yes	Yes	Yes

Table 2-9. Comparison of Alternatives (Alt.) By Issue and Resource Indicator

Issue and Resource Indicator	Alt. A	Alt. B	Alt. C	Alt. D
Aquatics/Fisheries Habitat				
RHCA Road Density (HUC5)	1.2 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2
– Upper Clear Creek HUC6	1.4 mi/mi^2	1.2 mi/mi^2	1.2 mi/mi^2	1.2 mi/mi^2
– South Fork Clear Creek HUC6	1.0 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2	1.0 mi/mi^2
– Lower Clear Creek HUC6	9.3 mi/mi^2	8.9 mi/mi^2	8.9 mi/mi^2	8.9 mi/mi^2
Number of undersized culverts replaced and cross drains added	0	69	69	69
Number of culverts removed	0	8	8	8
FISHSED results for modeled changes in cobble embeddedness:				
– Hoodoo Creek	33%	35% (+2%)	36% (+3%)	35% (+2%)

Issue and Resource Indicator	Alt. A	Alt. B	Alt. C	Alt. D
– Solo Creek	31%	33% (+2%)	33% (+1%)	33% (+1%)
– Pine Knob Creek	44%	46% (+2%)	46% (+2%)	46% (+2%)
– Clear Creek	38%	40% (+2%)	40% (+2%)	40% (+2%)
– Middle Fork Clear Creek	55%	56% (+1%)	56% (+1%)	56% (+1%)
– Brown Springs Creek	30%	33% (+3%)	33% (+3%)	32% (+2%)
– South Fork Clear Creek	20%	21% (+1%)	21% (+1%)	21% (+1%)
– Kay Creek	20%	20% (+0%)	20% (+0%)	20% (+0%)
Economics				
Volume Harvested (CCF)	0	141,500 CCF	158,000 CCF	116,400 CCF
Volume Harvested (MBF)	0	75,300	85,200	61,800
Jobs Sustained	0	1,910 jobs	2,133 jobs	1,571 jobs
Community Harvest Income	0	$54,252,000	$60,578,000	$44,628,000
Federal Income Tax	0	$8,138,000	$9,087,000	$6,694,000
Sale Feasibility (Present Net Value); excess money to the treasury or available for stewardship projects	0	$5,748,000	$5,264,000	$3,886,000
Fuels				
Percentage of Crown Fire Susceptible Landscape	51%	44%	44%	44%
Fire Regime Condition Class	FRCC2 (39%)	FRCC2 (38%)	FRCC2 (37%)	FRCC2 (38%)
Roadless Areas				
Effects to Wilderness Values:				
Natural Integrity	No effect	Beneficial Effect	Beneficial Effect	Beneficial Effect
Undeveloped Characteristics	No effect	Minimal Effect	Minimal Effect	Minimal Effect
Opportunities for Solitude or Primitive Unconfined Recreation	No effect	Temporarily Affected	Temporarily Affected	Temporarily Affected
Special Features and Values	No effect	No Effect	No Effect	No Effect
Manageability	No effect	No Effect	No Effect	No Effect
Soils				
Acres of potential skid trail/landing excavation on landtypes with high subsurface erosion hazard	0	308	308	295
Miles of temporary roads on landtypes with high subsurface erosion hazard	0	30 miles	30 miles	15 miles
Number of commercial harvest units requiring specialized design measures to meet Regional soil standards	0	77	78	75
Vegetation				
Percent Increase in Early Seral Species Froest Cover Type by Eco-setting (Ponderosa Pine/White Pine/Larch)				
Breakland Eco-Setting	0	6	7	4
Upland Eco-Setting	0	5	9	6

Issue and Resource Indicator	Alt. A	Alt. B	Alt. C	Alt. D
Increase in Young (0-40) Age Class by Eco-Setting (Acres based on 2012 existing condition)				
Breakland Eco-Setting	0	1,092	1,329	690
Upland Eco-Setting	0	1,506	2,776	1,471
Percent of FS Lands in Young Age Class	2	6	10	5
Old Growth	4654	4654	4654	4654
Dominant Vertical Structure Pattern Across Landscape	1 and 2 storied	1 and 2 storied	1 and 2 storied	1 and 2 storied
Patch Sizes of the Structural Classes (mean patch size in acres)				
– Seral shrub	179	252	252	252
– Stand initiation	48	96	104	91
– Stem exclusion	115	131	119	128
– Understory reinitiation	62	83	83	83
– Young multi-story	27	26	904	26
– Old single-story	77	116	121	116
– Old multi-story	74	81	72	81
Wildlife				
Wildlife Species' Habitat Effect (acres treated in modeled potential habitat)				
– American Marten	0	1562	1569	1152
– Black-backed Woodpecker	0	509	510	463
– Fisher*	0	3914	3435	2451
– Flammulated Owl	0	38	38	34
– Fringed Myotis*	0	47	47	39
– Long-eared Myotis*	0	1278	1283	877
– Long-legged Myotis*	0	1278	1283	877
– Mountain Quail	0	35	35	35
– Pygmy Nuthatch	0	80	80	64
– Northern Goshawk (Nesting)	0	298	298	290
– Pileated Woodpecker (Nesting)	0	875	875	772
– Ringneck Snake	0	493	493	389
– Western Toad Uplands	0	59	55	63
– Elk Winter Range (acres treated in MA 16)	0	4380	4502	3809
– Elk Summer Range (# of Elk Analysis Areas meeting Forest Plan – Standards)	7	7	7	7
– Elk Security- number of elk analysis areas meeting desired conditions (30%)	6	6	6	6

Issue and Resource Indicator	Alt. A	Alt. B	Alt. C	Alt. D
Canada Lynx				
– Acres of Denning Habitat Treated	0	0	0	0
– Acres of Foraging Habitat Treated	0	66	61	57
Consistent with the Northern Rockies Lynx Management Decision	Yes	Yes	Yes	Yes
North American Wolverine	0	725	725	725
Moose Winter Range (acres treated in MA 21)	0	776	776	630
Watershed				
Percent increase in equivalent clearcut area (ECA)				
– Upper Clear Creek (HUC 12)	0	12%	13%	11%
– South Fork Clear Creek (HUC 12)	0	6%	7%	5%
– Lower Clear Creek (HUC 12)	0	7%	9%	6%
– Clear Creek (HUC 10)	0	8%	9%	7%
Percent Sediment Yield Increased Over Base (Natural) as Modeled By NEZSED (Forest Plan Standard)				
– Pine Knob Creek (45%)	1%	18%	18%	18%
– Browns Spring Creek (45%)	2%	29%	30%	27%
– Clear Creek (30%)	1%	18%	18%	15%
– Solo Creek (45%)	2%	21%	21%	19%
– Middle Fork Clear Creek (30%)	1%	11%	11%	9%
– Kay Creek (45%)	1%	5%	55	4%
– South Fork Clear Creek (45%)	1%	9%	10%	7%
– Hoodoo Creek (60%)	2%	31%	32%	27%
Watershed Road Density (mi/mi2)				
– Pine Knob Creek	4.8	4.3	4.3	4.3
– Browns Spring Creek	4.1	3.2	3.2	3.2
– Clear Creek	2.3	2.3	2.3	2.3
– Solo Creek	3.5	3.1	3.1	3.1
– Middle Fork Clear Creek	2.4	2.2	2.2	2.2
– Kay Creek	2.5	2.4	2.4	2.4
– South Fork Clear Creek	1.6	1.6	1.6	1.6
– Hoodoo Creek	3.8	3.8	3.8	3.8
– Big Cedar Creek	4.6	4.4	4.4	4.4
– Lower Clear Creek Face	1.8	1.8	1.8	1.8

*Acres of commercial thinning and landscape burning are not included in these totals

2.5 MONITORING

RHCA monitoring would be conducted annually by the Forest Fisheries Biologist in conjunction with BMP audits. Monitoring would be conducted on randomly selected treatment units throughout the Forest and results would be made publicly available on the Forest's website. Both implementation and effectiveness of treatments would be monitored. Additional RHCA monitoring would be conducted. The focus would be on whether or not sediment travels from harvested and burned units into RHCAs, and also how far the sediment travels and whether or not it reaches a stream. It would be funded and conducted pursuant to PL111-11 Title IV Sec. 4003(g)(4). This monitoring would be conducted on portions of the following regeneration harvest units: #109, 122, 127,128, 150,155, 160, 214, 218, 235, and 236. See Figure 2-2 for locations.

Turbidity monitoring at 3 culvert replacement sites on or within 600 feet of steelhead designated critical habitat would occur during implementation. There are 2 on Clear Creek and 1 on the South Fork Clear Creek. The site locations are shown in Figure 2-2.

Five channel cross sections would be monitored in within the project area (Figure 2-2). Monitoring would be conducted to determine if harvest and/or road improvement activities are contributing enough sediment to the stream to cause changes to channel morphology and or degradation of habitat quality for steelhead trout. Other monitoring collected at these sites includes Wolman pebble counts (stream bed surface substrates), cobble embeddedness, air and water temperature, and relative fish densities by species. Wolman pebble counts and cobble embeddedness are used to monitor potential changes in substrate composition, particularly sand-sized or smaller fines which can negatively affect the quality of fish spawning and rearing habitat.

Initial cross section measurements would be taken in 2014 or 2015 prior to the proposed activities. The sites would be monitored 1, 2, and 5 years after project activities commence. Adjustments could be made to the activities if monitoring shows statistically significant changes in stream channel aggradation/degradation, widening of the channel, or increases in substrate fines. If a large natural flow event were to occur during the monitoring period, or unacceptable channel changes were observed at the monitoring sites, a survey of the streams, logging units and roads would be conducted to determine the location of sediment additions. Adjustments may or may not be required to proposed activities depending on this assessment. Project monitoring will help to ensure that BMPs are sufficient at minimizing adverse effects to ESA-listed species.

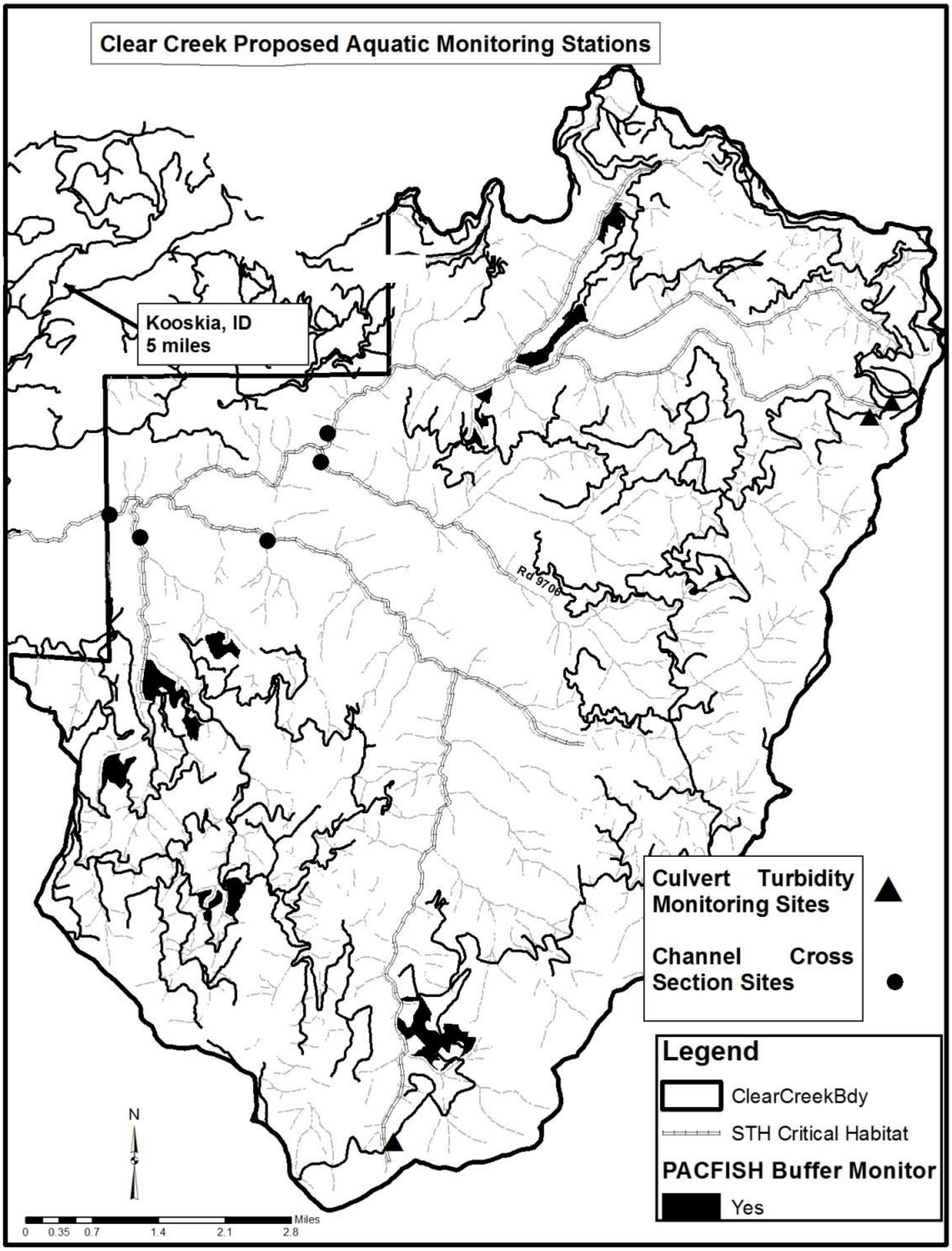


Figure 2-2. Aquatic Monitoring Locations for the Clear Creek project

Chapter 3–Affected Environment and Environmental Consequences

This section summarizes the physical, biological, social, and economic environments of the project area and the potential changes to those environments due to implementation of the alternatives. It also presents the scientific and analytical basis for comparison of the alternatives presented in Table 2-7, Table 2-8, and Table 2-9.

This section summarizes the effects of the alternatives on the aquatic resource, which includes water quality and fisheries. The section was summarized from the "Clear Creek Restoration Aquatics Report," available in the project record.

3.1 Aquatics

3.1.1 Analysis Area

The project area is about 43,700 acres and encompasses the upper two-thirds of the Clear Creek drainage and all of its tributaries. Clear Creek flows into the Middle Fork Clearwater River. This same area is considered the analysis area and was selected because it includes all Forest Service–managed lands—and all the streams therein—that could be affected by project activities.

3.1.2 Regulatory Framework

Nez Perce National Forest Plan (Forest Plan) direction and all federal and State laws and regulations applicable to watershed and fisheries resources would be applied to the project, including the Clean Water Act, the ESA, Idaho Water Quality Standards, and the Idaho Forest Practices Act.

3.1.2.1 Nez Perce National Forest Plan

Forest standards for water resources are found within the Forest Plan (USDA Forest Service 1987a, pages II-18 through II-22). The Forest Plan directs that forest management activities minimize sediment input to streams, meet beneficial uses, apply BMPs to ensure water quality standards are met or exceeded, and manage all water under the designated standards found in Forest Plan Appendix A. The project complies with this direction through the implementation of project design features and road improvement and decommissioning activities.

The Forest Plan was amended in 1995, following a joint decision (commonly called PACFISH) by the U.S. Forest Service and Bureau of Land Management (BLM) for managing anadromous fish-producing watersheds on federal lands, including streams within the project area. The standards and guides from PACFISH would be applied to the project.

The interim direction provided by PACFISH identifies and defines RHCAs, establishes RMOs, and applies standards and guidelines to meet the RMOs. RHCAs include those areas within 300 feet of fish-bearing streams, within 150 feet of non-fish-bearing streams, and 100 feet on intermittent streams and wetlands of 1 acre or less. RHCA widths exceed state BMP standards. All management activities must be designed to cause no adverse effect to the designated RMOs, which dictate certain standards for large, instream woody material, stream temperature, width-to-depth ratios, bank stability, and pool frequency. The project would comply with PACFISH.

36 CFR 219.20—These regulations require projects to achieve the following objectives: conserve the soil and water resource; protect streams, streambanks, and wetlands; provide for adequate fish habitat; and give special attention to riparian areas in regard to topography, vegetation type, soils, climate, and management objectives.

3.1.2.2 Endangered Species Act

The U.S. Fish and Wildlife Service (USFWS) lists bull trout as threatened under the ESA (www.fws.gov Feb. 6 2013). Steelhead trout and fall chinook salmon are also listed as threatened (National Oceanic and Atmospheric Administration [NOAA] www.nwr.noaa.gov). Consultation with the USFWS and NOAA is required for projects affecting these species. The project would be designed to have no long term adverse effects on listed species. The project would provide long term positive effects to listed species and their habitat.

Regional Forester Sensitive Species—Since the Forest Plan was published in 1987, the Regional Forester has approved an updated list for the Forest (February 2011). This list includes 4 fish species: westslope cutthroat trout, interior redband trout, Snake River spring chinook salmon, and Pacific lamprey. The western pearlshell mussel was added in 2010. A Biological Evaluation is required to determine the effects of the project on these species. The project may impact individuals but would not lead to the listing of species under ESA.

3.1.2.3 Idaho Forest Practices Act

This act regulates forest practices on all land ownerships in Idaho. Forest practices on National Forest lands must adhere to the rules pertaining to the act (IDAPA 20.02.01). The rules are also incorporated as BMPs in Idaho’s Water Quality Standards. The project would comply with the Idaho Forest Practices Act by implementing BMPs to protect and maintain water quality standards.

3.1.3 Analysis Methodology

3.1.3.1 Stream and Habitat Surveys

Past (1988, 1993) and recent stream survey data (2010-2012) were used to determine if instream conditions meet Forest Plan direction. Some of the recent field surveys assessed road and culvert conditions, as well as fish presence at road crossings. General stream conditions were also noted. Focused road surveys were conducted by the fish biologist in order to review stream crossings and drainage needs along roads near streams. The majority of road proposed for reconstruction were surveyed while only a few proposed for reconditioning were surveyed. General road conditions between crossings were noted and any problems with drainage or potential failure were identified. The road survey data were used to develop proposed project activities associated with roads. Google Earth (and other photo imagery), in combination with field surveys, was used to assess vegetative cover over project area streams and the availability of future woody material to those streams. Geographic Information System (GIS) was used to assess a variety of information, including road and stream miles within the project area.

Habitat and fish surveys on anadromous fish streams conducted by the Nez Perce Tribe in 1984 were reviewed. They also conducted habitat-only surveys on Lower Clear Creek below the Forest Boundary in 1986. Stream habitat and fish surveys were also conducted by the Forest for Clear, South Fork, Kay, West Fork, Hoodoo, Lost Mule, and West Branch in 1988; for the Middle Fork Clear Creek, Solo Creek, and Pine Knob Creek in 1993; and in Clear, Pine Knob, Brown Springs, Solo and Middle Fork in 1998. Information collected included physical data (stream type, habitat types, substrate, woody material, and sediment levels) and biological data (fish species, distribution, and densities); however some of the surveys did not collect all of the physical or biological data mentioned above. Where fish data was collected in Clear Creek, anhy species that was observed by the Forest Service or Nez Perce Tribe was recorded. Stream habitat surveys were also conducted in 2007 and 2010 in the mainstem, West Fork, and South Fork of Clear Creek and in Kay Creek as part of the PACFISH/INFISH Biological Opinion (PIBO) monitoring effort. Cobble embeddedness surveys were conducted by Forest personnel in 2011 and 2012 to determine compliance with Forest Plan water quality objectives. The USFWS Dworshak Fisheries Assistance Office was also contacted in 2012 and 2013 in regard to past surveys they conducted in Clear Creek. Their spawning ground and juvenile surveys were focused on chinook salmon only.

3.1.3.2 FISHSED Modeling

The Forest Plan requires the use of the cobble embeddedness indicator.in an analysis that considers project effects on aquatic habitat as it relates to fish productivity (i.e. habitat capacity). Cobble embeddedness is a measure of how the rocks in a stream are surrounded, or embedded, by small materials such as silt or sand. Estimates of existing cobble embeddedness in project area streams, combined with NEZSED outputs for peak sediment yield (see Watershed section), were used to predict potential changes in summer and winter rearing/carrying capacities for trout and salmon, using the FISHSED model (Stowell et al. 1983). The model is run at the Forest Plan prescription watershed level only. The basic model assumes that an inverse relationship exists between the amount of fine sediment in spawning and rearing habitats and fish survival and abundance. In general, when sediment yields are increased over natural rates, especially on a sustained basis, fish biomass decreases (Bjornn et al. 1977). FISHSED is most appropriately used to assess the effects of changes in habitat quality when cobble embeddedness changes are greater than 10% (Stowell et al. 1983). The FISHSED model is only useful for comparing alternatives (Conroy and Thompson 2011) and is not designed to predict actual sediment levels. FISHSED calculations and additional information about the model, including assumptions, are in the project file.

3.1.4 Resource Indicators

The following resource indicators were developed in response to public comments and internal concerns and are associated with proposed activities. Timber harvest was not considered as an issue indicator, because monitoring indicates that retaining RHCAs are adequate to prevent harvest-related sediment from reaching streams stability (USDA Forest Service unpublished data, 2014; Sugden et al. 2012; USDA Forest Service 2009b; USDA Forest Service 2006b; Sridhar et al. 2004; Lee, et al. 2004; Ott et al. 2005; USDA Forest Service and USDI BLM 1995; FEMAT, 1993; Belt 1992).

The Watershed Condition Framework (USDA 2011) was reviewed. It assessed watershed condition based on a variety of factors including forest health, soil, water, and roads. Watershed ratings reflect the level of watershed health or integrity. A watershed in good condition is one that is functioning in a manner similar to natural wildland conditions. The South Fork Clear Creek was rated as having high integrity or functionality. The Upper and Lower Clear Creek subwatersheds received moderate ratings and have been targeted for integrated restoration efforts through road-related and vegetative restoration activities. The road related projects are expected to provide the most direct long term benefits to water quality and aquatic habitats. These include recently completed projects as noted in Appendix J and those proposed in the Clear Creek IR project. For the purpose of the aquatics analysis, roads were the primary issue indicator, particularly those within RHCAs.

3.1.4.1 Roads in RHCAs

Many miles of system and nonsystem roads exist within PACFISH RHCAs. Many of these roads are not needed for future land management activities. Unneeded roads should be decommissioned to reduce potential sediment input into streams from road surface runoff and potential stream-crossing failures.

3.1.4.1.1 Resource indicator: RHCA road density

The roads needed for management should minimize the contribution of sediment to streams from road surface runoff. Installing culverts that drain onto the forest floor from roadside ditches instead of into stream channels would minimize direct sediment contributions. Installing culverts designed to handle 100-year flow events on all streams would minimize the potential for plugging of the structure by debris. Surfacing roads could also reduce sediment runoff.

3.1.4.1.2 Resource indicator: Number of undersized culverts replaced and cross drains added

Deposited Sediment: Excessive amounts of fine sediment, particularly sand, can reduce fish reproduction success by plugging spawning gravels and affecting egg development and/or larval fish emergence (Meehan 1991; Waters 1995). Sand bedload can also decrease food production by scouring or burying gravel substrates and can decrease the amount of fish cover by filling in pools and burying logs (Alexander and Hansen 1983, 1986). The Forest Plan requires that projects that increase sediment yield in a prescription watershed (to the extent that the activity would be considered an “entry”) be modeled in both NEZSED and FISHSED. Activities included in the modeling include timber harvest, temporary road construction, road decommissioning, road reconstruction, road reconditioning, and prescribed fire.

3.1.4.1.3 Resource Indicator: FISHSED results for modeled changes in cobble embeddedness

3.1.5 Affected Environment

3.1.5.1 Aquatic Habitats

Three bedrock falls act as natural barriers to upstream fish passage in the drainage. One is located 0.6 miles up from the mouth of Hoodoo Creek, the second is located on the West Fork Clear Creek, 2.8 miles up from the mouth, and the third is on the Middle Fork Clear Creek just above the mouth of Solo Creek. Surveys in 2010 and 2011 found no fish above the Hoodoo and West Fork barriers; however they were found in the Middle Fork above the barrier. One 15-foot bedrock falls barrier to steelhead and salmon was noted in 1988 surveys of South Fork Clear Creek. It was subsequently removed in 1990 to provide access to 7 miles of additional habitat.

Stream substrates through the drainage vary from sand in the low gradient channels to boulders, rubble and gravel in the remaining channels. The highest quality and quantity of salmon and steelhead spawning substrate was observed in the South Fork Clear Creek above the barrier that was removed in 1990. Lower quality habitat was noted below the barrier and in the mainstem of Clear Creek. Overhead cover and wood was noted as limited in the South Fork, Middle Fork, and mainstems of Clear Creek. These are naturally occurring levels are not related to land management activities since timber harvest did not occur in those areas (see effects of management activities discussion below).

Stream surveys conducted on private lands in lower Clear Creek indicate high levels of sediment and higher-than-preferred stream temperatures (Nez Perce Tribe 1987). Sediment levels and temperatures were lower on NFS lands (Nez Perce Tribe 1987). Shallow water depths and lack of pool habitat were noted as issues affecting fish production in the middle and upper reaches of Clear Creek. Surveys conducted in 1993 also noted the same sediment, wood, and pool limitations. The low number of pools is directly related to low wood levels, because wood is the primary creator of pool habitats in these stream types. Low wood levels are mostly a result of large wildfires that occurred in the area. Stream bank stability was noted as good to excellent throughout the drainage due to the presence of dense streamside vegetation and large substrate (cobble, rubble, boulders) which armor the banks against the erosive power of the streams. Bank stability remained in good to excellent condition based on 2010-2012 field observations.

Water temperature criteria that currently apply to the Nez Perce National Forest come from four sources: Idaho Water Quality Standards (IDAPA 58.01.02); Forest Plan Desired Future Condition (DFC) Tables (USDA 1992); PACFISH Interim Riparian Management Objectives (RMOs) (USDA Forest Service 1987a); and the local Matrix of Pathways and Indicators of Watershed Condition (NOAA 1998).

State and Federal water quality criteria for temperature range from 9 °C to 19 °C, depending on the guidance source and aquatic species being protected. These criteria are commonly exceeded in the mainstem of Clear Creek and several of the tributaries. Natural climatic and physical factors (such as channel width and depth, geologic formations, and natural fire influences) account for some of the standards being exceeded. Temperatures in the lower 10 miles of Clear Creek, all of which are on private/state lands, exceed standards as a result of both natural causes and human-relate activities such as shade removal, riparian species conversion to Japanese knotweed, and channel straightening or simplification. Although temperatures may exceed standards, there are no water quality limited streams within the Clear Creek drainage (IDEQ Integrated Report 2014). Pine Knob, Brown Springs, Solo, Middle Fork Clear and the mainstem of Clear Creek meet their beneficial uses. The remaining streams were not assessed.

Optimal stream temperatures for juvenile chinook salmon and steelhead trout rearing is 14–19 °C (US EPA 2003). Lethal temperatures for juveniles occur if they constantly exceed 21–23 °C for 1 week or longer. Optimal stream temperatures for juvenile bull trout rearing is 9-14°C (IDEQ, 2003; Rieman et al, 2007) which is considerably colder than for other salmonids. Streams on Forest Service managed lands stayed below or at 19 °C maximum temperatures for all of the measured sites for all of the measured years (see Table 3-1, below). All streams for all years measured had maximum stream temperatures that were within the optimal range for salmon and steelhead juvenile rearing as noted by EPA. They rarely met optimal requirements for juvenile bull trout rearing during the summer months. Temperatures fluctuated greatly between years and were dependent on weather trends. The data reviewed for streams with 6 or more years of data showed, for example, that 1992 and 1998 were very warm years while 1993 was a cool year (data can be found in the project file).

Table 3-1. Maximum Stream Temperatures Measured Throughout the Clear Creek Drainage on Forest Service Managed Lands

Stream	Maximum Temperature Range (°C)	Number of Years Monitored between 1991 and 2011	Warmest Year Recorded
Clear Creek at FS Boundary	15–19	3	2007
Clear Creek at Pine Knob	15–17	2	2011
Hoodoo Creek	15–17	8	1998
WF Clear Creek	15–17	2	1991
SF Clear Creek at mouth	19	1	1991
SF Clear Creek above Kay	14–19	9	1992
Kay Creek	15–17	6	1998
MF Clear Creek above Solo	14–17	3	1994
Solo Creek	14–17	2	2011
Pine Knob Creek	16–17	2	2011
Browns Spring Creek	17	1	2012

Temperature data shows variation across the watershed depending on the year measured. The Idaho cold water communities’ criteria of not-to-exceed 22 °C were met in Clear Creek at all sites except below the Forest boundary. Exceedance of the Idaho salmonid spawning criteria of not-to-exceed 13 °C were noted at all sites at certain times of the year.

Stream temperatures at the subwatershed level were rated using the PACFISH/NOAA (1998) indicators for steelhead and bull trout with the results listed in Table 3-2.

Table 3-2. Stream Temperature Ratings at the Subwatershed Level

Indicator	Rating	HUC6 Watershed
Steelhead Spawning	High (Good)	Upper Clear Creek
	Moderate	South Fork Creek; Lower Clear Creek
Steelhead Rearing	High	Upper Clear Creek; South Fork Clear Creek
	Moderate	Lower Clear Creek
Bull Trout Spawning	Low (Poor) (>10^{o})	Upper Clear Creek; South Fork Clear Creek; Lower Clear Creek
Bull Trout Rearing	Moderate (13^{o}-15^{o})	Upper Clear Creek; South Fork Clear Creek
	Low (>15^{o})	Lower Clear Creek

The Kooskia Fish Hatchery has been collecting temperature data at the hatchery. This data was used to compare temperatures leaving the Forest Boundary to those near the mouth of Clear Creek in order to determine the amount of increase in the lower reach of stream on private lands. Only the hottest period (July–Aug) was used as this would be the most critical period for chinook salmon migration and spawning, steelhead rearing, and bull trout migration. Average maximum temperatures in 2007 at the Forest boundary were 19 °C and were 24 °C at the hatchery. Data compared for August of 1991 and 1992 had temperatures of 20 °C at the boundary and 27 °C at the hatchery. Temperatures in 1993 were 17 °C at the boundary and 19 °C at the hatchery. Temperatures at the boundary were below lethal levels for salmon and trout but consistently increased toward lethal temperatures downstream. Temperature increases are natural in the downstream direction due to channel widening, reductions in stream depth because of widening, and the increased exposure of the stream to direct solar radiation and convective heating (Rayne et al. 2008). The increase on private lands is also associated with the presence of the main Clear Creek road and limited overhead riparian vegetation in some areas along the stream.

Stream temperatures are naturally high at the mouth of Clear Creek and have been since before timber harvest on federal lands started in earnest. The USGS maintained a gaging station in at the mouth of Clear Creek in 1962 and collected both flow and temperature data. Maximum temperatures during July and August ranged from 17 °C to 28 °C with 90% and 80% of the days, respectively, exceeding 20 °C. These temperatures are similar to those found in more recent monitoring efforts mentioned above. Prior to 1962, a total of 1,032 acres (2%) of timber harvest occurred on Forest Service lands, all of it within the Hoodoo prescription watershed. The majority of units either retained a small buffer or avoided water altogether. Minimal effects to temperature would have been expected to due to these design features and the fact that the riparian areas were well vegetated with older trees throughout the prescription watershed (Figure 3-1). There was no other federal harvest in the drainage that would have affected stream temperature. The 1962 data is therefore considered the baseline for assessing temperature affects from Forest Service lands. Since temperatures at the mouth of Clear Creek are similar to what they were in 1962 before widespread harvest, it can be assumed that Forest Service management has had little effect on stream temperatures.

3.1.5.1.1 Aquatic Species

Habitat for cutthroat trout, a Region 1 sensitive species, occurs in all fish-bearing streams. Cutthroat trout were observed between 2010 and 2012 well into the headwaters of most of the streams, but densities were not measured. Surveys conducted by the Forest in 1993 found very high densities of cutthroat trout in Solo Creek and Middle Fork Clear Creek below Solo Creek. High concentrations were also found in upper Clear Creek, West Fork Clear Creek, and upper Pine Knob Creek during Nez Perce Tribe surveys (Nez Perce Tribe 1984). The majority of timber harvest and road building occurred between 1960 and 1990. The high densities and wide distribution of fish would indicate that cutthroat have not been greatly affected by these activities.

Clear Creek includes 45 miles of designated critical habitat for ESA-listed steelhead trout on private and federal lands (ESA listed as threatened). A total of 35 miles occurs on federal lands. In past surveys, steelhead were found in moderate densities in Pine Knob Creek and lower Middle Fork Clear Creek, but none were found in Solo Creek (USDA Forest Service 1993) or West Fork Clear Creek (Nez Perce Tribe 1987). Low densities were found in South Fork Clear Creek (USFS 1988; Nez Perce Tribe 1987). Prior to the 1990 removal of the South Fork Clear Creek barrier, steelhead had access to 28 miles of habitat.

NFS lands along Clear Creek include 13 miles of spring chinook (a Region 1 sensitive species) habitat. Prior to the South Fork Clear barrier removal, NFS lands provided only 6 miles of habitat for chinook. There are 7 miles of potential, but low to fair quality habitat on private lands below the Forest boundary. Several adult and juvenile chinook salmon were observed during 1988 habitat surveys in Clear Creek and the lower South Fork of Clear Creek below the barriers. Habitat for chinook tends to occur in the middle and lower reaches of large streams such as the South Fork and mainstem of Clear Creek. Compared to cutthroat trout, these species require larger streams and substrate for spawning and rearing. The Kooskia National Fish Hatchery, near the mouth of Clear Creek, annually released 20–30 adult chinook above their trapping weir from 2006 to 2008. These fish likely spawned on the lower reaches of National Forest lands or on private lands.

Bull trout were not found during fish surveys conducted by the Forest Service in1988 or 1993 or by the Nez Perce Tribe in 1984. One adult bull trout was observed at the Kooskia Hatchery weir in 1997 and another adult again in 2012 (C. Bretz, pers. comm). No others were observed between those years. The absence of bull trout is expected, as water temperatures are not conducive for juvenile rearing of this species, or for adults during the summer or the fall spawning migration period.

Bull trout prefer cold temperatures (below 14 °C) in the summer and are generally found in higher-elevation streams such as those in the upper Lochsa River (well upstream of the project area). Summer stream temperatures were measured in the project area between 2007 and 2011. Daily maximum temperatures during the summer months averaged 13–20 °C depending on the stream and the year. Bull trout typically move from mainstream rivers into spawning tributaries from late spring through mid-summer. High summer stream temperatures near the mouth of the stream likely act as a thermal deterrent to upstream migrating bull trout. Temperatures for juvenile summer rearing bull trout are considered unsuitable because the measured seven day maximum averages about 15oC in representative fish bearing reaches measured in Clear Creek tributaries.

In addition to survey and stream temperature data, modeling results for predicted bull trout occupancy produced by the Rocky Mountain Research Station (http://www.fs.fed.us/rm/boise/AWAE/projects/ClimateShield.html) was considered. Modeling is based on Climate Shield research (Isaak, 2012). The model uses stream temperature data from across the Columbia basin to develop accurate temperature predictions for continuous stream reaches in drainage, just not the immediate location of temperature sensors. Some of the data used in the research comes from numerous locations on Nez Perce- Clearwater National Forests. Modeled temperature data is then combined with known bull trout stream habitat preferences to assess the probabilities of bull trout occupancy (Isaak et al, 2015). The model also predicts effects of climate change on bull trout by modelling stream climate changes for a future time period and then comparing temperatures for current conditions. Model run results for tributaries in the project area are:

- Upper Brown Springs- 8% probability- 0.6 miles occurs on known fish bearing and 1.4 miles occurs on known non-fish bearing streams
- Upper Clear Creek- 9% probability- 1.6 miles occurs on fish bearing and 1.1 miles occurs on non-fish bearing streams
- Upper Middle Fork- 14% probability- 1.4 miles occurs on fish bearing and 1.2 miles occurs on non-fish bearing streams
- Upper Kay- 12% probability- 1.5 miles occurs on fish bearing and 2.4 miles occurs on non-fish bearing streams
- Upper West Branch- 12% probability- all in non-fish bearing streams
- Hoodoo- 9% probability- all in non-fish bearing streams

The model was also run for climate change predictions for the year 2040. The probability of bull trout presence dropped to zero in all tributaries in Clear Creek due to modeled warmer than preferred stream temperatures.

The USFWS did not designate Clear Creek drainage as critical habitat for bull trout. When considering past biological surveys, published bull trout juvenile rearing requirements, and modeling results for occupancy, bull trout spawning and rearing is not considered to occur in tributary streams in the project area now, nor is it expected to occur in the future.

No surveys for pearlshell mussels or Pacific lamprey, both Region 1 sensitive species, have been conducted in the Clear Creek drainage, and neither of these species was mentioned during habitat surveys. While mussels may be present, none were observed during field surveys between 2010 and 2012. They prefer stable habitats near banks with coarse sand, and cobble or boulder substrates. Lampreys are not likely to occur in Clear Creek due to low numbers of returning adults in the Snake River. Counts of returning lamprey were conducted over Lower Granite Dam between 2000 and 2011. The data shows a low of 12 returning in 2009 to a high of 282 in 2003 (USDI Fish and Wildlife Service 2012). The 12-year average totaled just 70 adult lampreys. Lamprey prefer habitat dominated by sandy substrates and lesser amounts of cobble or gravel. Habitat is likely available, although sporadic, for both species in the mainstems of the South Fork, Middle Fork and Clear Creeks where low gradients (<3%) and coarse and sandy substrates occur.

No redband trout, a Region 1 sensitive species, were identified during past or recent surveys. This is in part due to their physical similarities to steelhead trout which often make them difficult to separate from steelhead. Redband trout typically occupy similar habitats as westslope cutthroat trout.

Brook trout were observed in Kay Creek in good numbers but were not noted in other streams. Brook trout can adversely affect cutthroat trout through competitive exclusion. It is expected that they may be isolated and did not expand into other tributaries based on survey observations.

3.1.5.2 Water Quality Objectives and the Forest Plan

The Forest Plan contains water quality objectives for streams in the project area (USDA Forest Service 1987a, Appendix A). These objectives are assessed using the DFC Analysis developed by Espinosa (1992) and are based on sediment levels as directed by the Forest Plan Appendix A Guidance document (Conroy and Thompson 2011). Specifically, the guidance document states the following:

> Of the basinwide stream survey data collected over the years, the habitat components that appear to be the most repeatable and most reliably differentiate between reference and managed watersheds are measures or estimates of substrate condition, including cobble embeddedness and percent surface fines. In addition, fish/water quality objectives in Appendix A were originally established based on substrate sediment only (Stowell 1986).
>
> …The portion of the DFC analysis that provides objectives for cobble embeddedness and percent fines by depth would be retained. Collection of measured substrate data, combined with existing legacy data and current PIBO data, where available, would be used to describe the existing condition. Substrate data would be the primary determinant in assessing whether Appendix A fish/water quality objectives are met.

Appendix A states that an upward trend (improvement) is required for streams that do not currently meet the water quality objectives. Timber management can occur in watersheds not currently meeting their water quality objectives concurrent with improvement efforts as long as a positive, upward trend in habitat carrying capacity is indicated. Data shows that all streams except Pine Knob, and the mainstem and Middle Fork of Clear Creek meet their Forest Plan water quality objectives based on cobble embeddedness monitoring (Table 3-3). Cobble embeddedness and percent fines by depth were the parameters used to determine whether or not the objectives were being met (as directed by the Forest Plan and Appendix A Guidance). Embeddedness was measured at the mouth of the streams in B or C channel types.

Table 3-3. Water Quality Objectives for Watersheds in the Clear Creek Project Area

Forest Plan Prescription Watershed	Forest Plan Water Quality Objective	Fishery Habitat Potential 1987	Percent Cobble Embeddedness (year)[a]	Fishery Habitat Potential[b] 2012	Water Quality Objective Met?
Pine Knob Creek	80%	50%	44% (2012)	65%	No
Browns Spring Creek	80%	50%	30% (2012)	82%	Yes
Clear Creek	90%	50%	38% (2012)	75%	No
Solo Creek	80%	70%	31% (2012) 46% (1993)	81%	Yes
Middle Fork Clear Creek	90%	50%	51% (2014) 55% (1993)	59% 55%	No
West Fork Clear Creek/ Hoodoo Creek	70%	50%	33% (2012)	79%	Yes
The two streams below utilized PIBO monitoring % surface fines by depth data (the most recent data available) in lieu of cobble embeddedness data[c]					
Kay Creek	80%	60%	18% (2007)	80%[c]	Yes [c]
South Fork Clear Creek	80%	50%	11% (2010)	80%[c]	Yes [c]

[a]Desired conditions for cobble embeddedness for low and moderate (<5%) gradient channels are as follows: 90% objective- CE<30%; 80% objective- CE<35%; 70% objective-CE<40%.

[b]Fishery habitat potential is assessed based on the Forest DFC Analysis (Espinosa 1992). Existing cobble embeddedness levels are compared to a DFC graph to obtain the Fishery Habitat Potential percentages. . If the Fishery Habitat Potential is greater than or equal to the Forest Water Quality Objective, the objective is being met. The actual % cobble embeddedness level is not equivalent to the Forest Plan Water Quality Objective.

[c] Desired conditions for surface fines from the NOAA Matrix (1998) are <10% for High (good) condition, 11-20% for moderate condition and >21% for low condition. The PIBO data, which is the most recent data available, was used to assess substrate conditions. Surface fines were not assessed in Espinosa (1992) however given that current conditions have a moderate Matrix rating, they are estimated to be meeting the Forest Plan water quality objective using the following: If the 90% Forest Plan objective is equal to or less than the low condition for cobble embeddedness (i.e. <30%), then the 90% objective would be met if % surface fines were equal to or less than the low Matrix condition (i.e. <21%). The categories are similar for % fines by depth where the 80% water quality objective from Espinosa falls within the Moderate matrix category. Give that % surface fines for the two watersheds both lay within the Moderate matrix category; it suggests that the watersheds meet their 80% water quality objectives.

Pine Knob, Clear Creek, and Middle Fork Clear Creek do not meet their Forest Plan water quality objectives; however IDEQ has determined that they do meet their beneficial uses (2014). DEQ determines whether a water body fully supports its designated and existing beneficial uses by evaluating whether the applicable water quality standards and criteria are being achieved and whether a healthy, balanced biological community is present (http://www.deq.idaho.gov/water-quality/surface-water/beneficial-uses.aspx). Beneficial uses are determined using both physical habitat data and biological data (insect and fish presence in varying levels). It should be noted that even streams in unmanaged areas (roadless,wilderness) often do not meet their DFCs (IDEQ 1999; various stream habitat surveys from the Clearwater NF) due to natural processes and the fact that streams systems are not static.

3.1.5.3 Management Activities Affecting Streams

PACFISH was designed to halt degradation and begin recovery of streams where listed fish species occur in the Columbia River drainage. It accomplishes this through streamside RHCA retention and other guidance for management activities within RHCAs. RHCAwidths are 300 feet on each side of a fish-bearing stream, 150 feet on perennial non-fish-bearing streams, and 100 feet on intermittent stream channels. At least 10,700 acres (24%) of the analysis area are within PACFISH buffers.

Regeneration timber harvest activities have occurred on approximately 22% of NFS-managed lands since the 1930s with an associated 190 miles of road building. An assessment of aerial photos shows that no-harvest buffers were retained since the 1960s on all but about 8% (700 acres) of the units. On the majority of the units (92%), buffers were a minimum of 50 to 100 feet wide. A total of 440 acres of regeneration harvest have occurred in the project area since PACFISH was implemented and appropriate-sized buffers were retained. A review of vegetation successional stages within the RHCAs is presented in Figure 3-1. This data indicates that 9% are early successional (<40 years old), 34% are mid-seral (41–100 years old), 18% are mature (101–149 years old), and 39% are late successional (>150 years old). The majority of mid-seral stands are located in the Clear Creek Roadless Area, lower Hoodoo Creek, and lower West Fork Clear Creek and are a result of the 1931 wildfire that burned in the area. Successional stage information, combined with field reviews of the streams from 2010 to 2012, indicates that RHCAs are well vegetated and only minimally (9%) affected by past timber harvest activities.

Roads near streams are the primary land management–related activity that affects stream conditions in the project area. Roads within riparian zones confine channels, which can negatively affect sediment and stream flow movement (Meehan 1991). Culverts under the roads are often undersized, impeding the passage of water and woody material during high flows. The small culvert size increases the risk that the pipe will plug with material and fail during high-flow events. Plugging of pipes can lead to an unwanted sediment pulse in streams. Crossing failures are costly to fix, and the sediment delivered to streams can take decades to flush out of the system. Road failures disturb existing vegetation and expose bare soil to potential erosion until the site heals. Riparian roads reduce stream shading and disrupt large, woody material recruitment through tree removal. Ditchlines that drain roads can direct flow and road surface sediment into perennial streams at crossings. These roads can be a chronic (ongoing) source of sediment and can increase water yield in streams. Roads located further away from streams with adequate cross drain structures limit the delivery of runoff and sediments to the streams. The placement of additional drains close to stream crossings can significantly reduce the volume of runoff delivered at stream crossings (Takken et al. 2008).

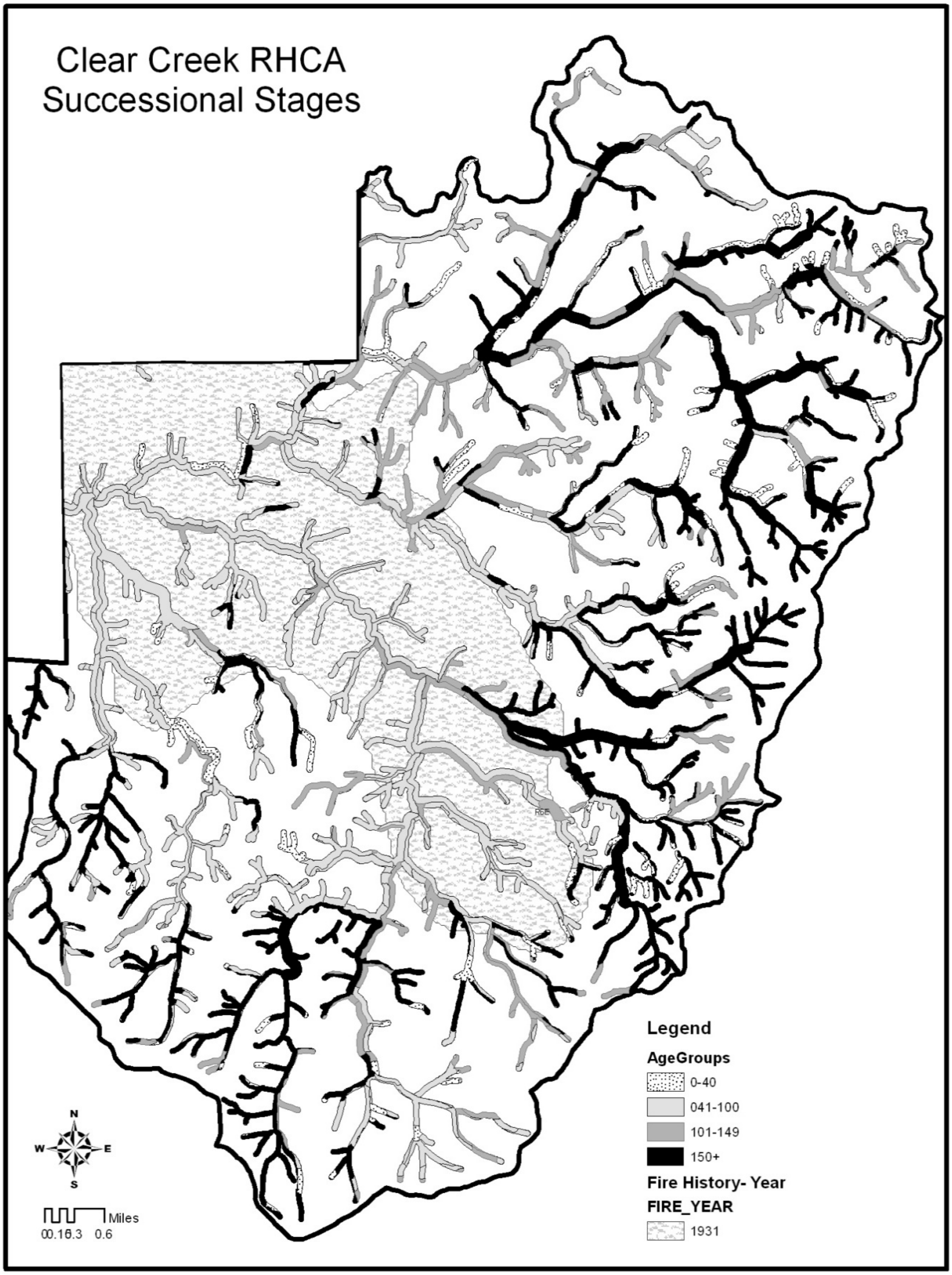


Figure 3-1. Vegetation Successional Stages within Riparian Habitat Conservation Areas in the Clear Creek Project Area

The local Forest Service, BLM, USFWS, and NOAA use the Matrix of Pathway Indicators (NOAA 1998) to describe a variety of stream habitat and watershed conditions. They are considered “good” when streamside road densities are <1 mile per square mile (mi/mi^2), “moderate” at 1–2 mi/mi^2, or “poor” at >2 mi/mi^2. A total of 20 miles of NFS system roads exist within RCHAs, contributing to an overall road density of 1.2 mi/mi^2. Takken et al. (2008) observed that the potential impact of roads cannot be measured accurately using a simple index of road density. Although road density is clearly important, primarily through the obvious impact upon the number of direct stream crossings, factors such as contributing area to a road drain, landscape position, and distance to streams are also significant factors.

MacDonald (2005) found that only 25% of the 285 road segments he studied delivered sediment to streams. A recent study using GRAIP monitoring showed that 7% of all drainage points in the study area delivered 90% of the road related sediment, and 2% delivered 50% of sediment (Black 2013). Roughly 11% of the Forest roads (all roads in RHCAs) in Clear Creek have the potential to contribute, and are likely contributing some sediment to streams. All but portions of three roads in Clear Creek have been constructed perpendicular to streams instead of running along their length. This design limits the negative effects from roads on streams by minimizing the interaction and connectivity between the two. In addition, 85 miles of system and nonsystem roads have been decommissioned since 2012 (USDA Forest Service 2011b,c). The roadwork included 3.5 miles of roads in RHCAs and at least 22 stream crossing removals.

Stream/road crossing surveys have been conducted on 90% of the NFS roads from 2010 through 2011. Only those roads proposed for retention were reviewed, since all crossings on roads proposed for decommissioning would be removed. A total of 200 crossings were assessed for condition, aquatic passage, potential failure risk, and level of work needed. Culverts or bridges were in place at 168 crossings; at 14 crossings, roads were in place, but culverts had been removed. A total of 10 culverts were cleared through previous NEPA for replacement (Clear Creek Culvert Replacement Project, 2011). Four of these were replaced in 2012; two were replaced in 2013. The remaining 4 culverts will be replaced in 2014 and beyond. A total of 4 culverts were cleared for removal in 2011, with all being removed in 2012 and 2013.

The road reviews found 58 culverts (“pipes”) that were adequately sized and had no need for work; 26 pipes in need of cleaning; 2 moderate-priority and 6 low priority pipes needing removal; and 69 culverts in need of replacement (32 moderate-priority, and 37 low-priority). Roughly 40 of the pipes (62%) drain very small streams or seeps and would be replaced with 24- to 36-inch-diameter structures. The remaining 29 pipes would be replaced with structures ranging from 4 to 9 feet in diameter.

The general overall conditions of roads and their surfaces were noted during culvert inventories. There were very few drainage, erosion or potential failure issues identified along the roads. Graveled roads showed little to no rutting or visible erosion. Ditchlines along the roads were vegetated with grasses, shrubs or very small trees and most were functioning. A total of 48 sites were noted as needing the following repairs: add pipe for drainage or fix existing drainage (29 sites), clean ditch to provide drainage (4 sites), fix fill slope due to cracking (3 sites), fill holes in road (1 site), decommission road (11 sites). The Clear Creek project proposes to decommission 6 of the sites that would have required new or improved drainage in addition to the 11 sites proposed for decommissioning. Native surface roads were mostly low gradient with some having a layer of base rock and most being vegetated by mosses, grasses and forbs. Very few of the roads had trees growing on the driving surface but most closed roads had small trees growing along their outer margins.

NFS system roads within the project area total 190 miles, of which 147 miles (77%) are graveled roads and 43 miles (23%) are native surfaced (dirt). Placing gravel on roads has been shown to reduce sediment runoff from the road surface (Meehan 1991). Burroughs and King (1985) also conducted a study on the Nez Perce Forest using simulated rainfall to generate runoff and sediment yield from forest roads, ditchlines, and fill slopes. The reduction in sediment production by graveling the road was 79% and remained effective for several years. They also found that where dense grass cover was present on the fill slopes of the road, sediment yield was reduced by 99%. The cut and fill slopes of roads within the Clear Creek project area are densely vegetated with grasses, shrubs, and trees. The majority of ditchlines also contain grasses, which can trap sediment. These conditions, along with the perpendicular stream/road crossings mentioned previously, minimize the risk of roads contributing large amounts of sediment to streams.

Road use by motorized traffic disturbs the road surface, with some of the soil being deposited into ditchlines, where it can be delivered to streams (Meehan 1991). Within the project area, 106 miles of roads are open seasonally or year-round to motorized use. A total of 66 miles (62%) of these are graveled, and 40 miles (38%) have a native surface. Within the 20 miles of roads located in RHCAs there are a total of 8 miles of gravel roads open year round to all vehicles, 3 miles of graveled roads open seasonally to all, and 2 miles open year round to some (1 mile gravel, 1 mile native surface). The remaining 7 miles are closed to all traffic. The combination of minimal road/stream crossings, gravel surfacing, and restricting traffic on the roads within RHCAs has helped to minimize sediment input to streams.

Roads on landslide prone landscapes have the potential to fail and contribute large quantities of sediment to streams. These roads may remain unstable over time and may contribute to chronic sediment erosion if not stabilized. Watersheds are in a high condition when landslide prone road densities are <1 mi/mi^2 (NOAA, 1998). Landslide prone road densities are <1 mi/mi^2 and in a high (good) condition on federal lands. Only one road-related landslide was observed during the road surveys. The majority of roads in Clear Creek occur on stable ridgetops with minimal risk of failure. No past road-related slides were evident during surveys; however fill cracks and other issues were noted and incorporated into the project design (road decommission or improvement).

The overall risk of roads contributing sediment to streams is considered low on 170 miles of road. The low risk is associated with restricted-use roads, roads with gravel surfacing, and roads where live stream crossings are limited or nonexistent or not located on landslide prone areas. The risk is moderate on the remaining 20 miles of road (all in RHCAs), as these roads include multiple live stream crossings and some form of motorized use.

3.1.5.4 Upward Trend Determination

Appendix A of the Forest Plan states that where streams do not meet their water quality objectives, timber management can occur concurrent with improvement efforts as long as a positive, upward trend in habitat carrying capacity is indicated. The Forest Plan water quality objectives were not met in Pine Knob, and the mainstem and Middle Fork of Clear Creek prescription watersheds as previously discussed. The remaining watersheds meet their Forest Plan water quality objectives and are not subject to the upward trend discussion.

The water quality objectives make up only a small part of the upward trend determination. The guidance for implementing Appendix A (Conroy and Thompson 2011) states the following: “Upward trend means that stream conditions that are below the Forest Plan objective will move toward the objective over time. Stream specific determination of existing condition and present or future improving trend should be done through a convergence of evidence using stream surveys, monitoring results, watershed condition inventories, literature reviews, predictive modeling, and professional judgment. It must be demonstrable that an improving trend is either in place and will continue, or that an improving trend will be initiated as a result of past, present and future management activities. The Forest Plan did not specifically intend that the improving trend be in place prior to initiation of new activities. It also did not specify a time factor for achieving fish/water quality objectives in below objective watersheds.”

It goes on to say that, “It was assumed in the Forest Plan that implementation of instream restoration and other watershed restoration activities would result in an upward trend in carrying capacity. Where these activities have been implemented, it could be stated that an upward trend in the habitat conditions has been accomplished. In previously degraded watersheds, especially those identified as below objective in 1987, if there have been no entries or natural disturbances over the past 10 to 20 years, it could be assumed that trend is either static or improving. If any watershed restoration has been implemented, or if a change in management (e.g. grazing and roads management) has resulted in fewer potential adverse effects to streams, an upward trend could be assumed in these cases as well.

The presence, absence, or densities of fish species can aid in the determination of overall stream health, however densities can be highly variable and are difficult to tie specifically to land management activities or upward trend. This is especially true for salmon, steelhead, and lamprey which migrate to the ocean then return to spawn in local streams. These species are heavily influenced by factors that occur outside of the Clear Creek watershed (i.e., dams, fishing, and ocean conditions). If adults return in low numbers, then juvenile densities would also be low and not necessarily associated with watershed conditions in Clear Creek. The Forest Plan upward trend is associated with habitat conditions and not fish densities in part due to these influencing factors. Trends in fish populations would be useful, if available, but are not required for determining whether or not an upward trend exists (Conroy and Thompson 2011).

Timber harvest has occurred in the Clear Creek drainage in the last 20 years (4,922 acres or 11% of the drainage). Streamside buffers were retained on the majority of units in order to protect aquatic habitats by limiting sediment input and providing for shade and future woody material. Since 1995, significant management changes to protect riparian areas were made through the adoption of RHCAs. Roughly 24% of the project area lies within these areas. Only 9% of the vegetation within designated RHCAs is less than 40 years old and 57% is older than 100 years. This indicates relatively minor potential effects to streams from harvest because the vast majority of riparian areas are intact.

Timber harvest can affect water yield in a stream system (see detailed discussion in the Watershed section). Water yield refers to stream flow quantity and timing and is a function of water, soil, and vegetation interactions. Changes in amount or distribution of vegetation can affect water yield and ultimately alter stream channel conditions. Determining the Equivalent Clearcut Area (ECA), which represents the extent of forest canopy openings from fire, harvest, and roads, can assess changes in amount and distribution of vegetation. A measurement of 20%–25% equivalent clear-cut area (ECA) is generally recognized as the threshold for when peak flow increases become detectable (Gerhardt 2000). ECA for Clear Creek is currently 4%. High quality habitat is associated with ECA of less than 15% in a 5th code watershed. Clear Creek is currently in a high condition for ECA.

There are 190 miles of Forest Service roads within the watershed, 20 of which are within RHCAs. As previously discussed they occur in low risk areas for failures and are mostly graveled which limits the potential input of sediment to streams. In addition Forest Service road decommissioning has, and continues to occur in the watershed. Fourteen culverts were identified for replacement/removal to allow for aquatic organism passage and to reduce the risk of failure in 2010. Six of those pipes have been installed as of 2013, four pipes were removed, and the remaining pipes are expected to be installed within the next 4 years. See Appendix J for a detailed discussion of past and proposed aquatic restoration activities that have occurred in Clear Creek and contribute to upward trend in the drainage.

Relatively little timber harvest activity has occurred in the Clear Creek watershed, roads are graveled and positioned to reduce their effects on streams, and watershed restoration activities have, and are occurring (road decommissioning, culvert replacement). In addition, the majority of riparian areas are intact with minimal effects from management. The riparian areas and RHCAs contain all of the components necessary contribute to a recovering trend. All these factors combine to indicate that there is an overall upward trend in aquatic habitat carrying capacity on Forest managed lands in Clear Creek

3.1.5.4.1 Pine Knob Creek Prescription Watershed

The 2,622 acre Pine Knob Forest Plan prescription watershed does not meet its water quality objective of 80% for fishery habitat potential. Cobble embeddedness was measured at 44% in 2012. When assessed against the DFCs (USDA 1992), the watershed currently is at 65% of habitat potential. It was at 50% of its habitat potential when the Forest Plan was written in 1987. This would be considered an upward trend based on fishery habitat potential.

There are about 3 miles of fish-bearing and 7 miles of non-fish bearing streams in Pine Knob Creek. The stream is mostly suitable for steelhead trout and westslope cutthroat trout. The lower 0.5 miles may be used by juvenile chinook salmon for rearing. The substrate is generally too small for chinook salmon spawning. Steelhead trout and cutthroat have been found in in the stream during 1984 and 1993 surveys.

Stream temperatures were measured in Pine Knob Creek in the summer of 2011. Stream temperature conditions based on NOAA matrix ratings were High for steelhead spawning and rearing (10.7°C and 13.8°C respectively). Cool temperatures are a result of well forest areas adjacent to streams (see RHCA discussion below). Temperatures were moderate for bull trout rearing (13.8°C) and low for bull trout spawning/incubation (10.5°C). This is consistent with the Climate Shield model results (Isaac, 2015) which showed a zero probability of bull trout presence based on warmer than preferred summer water temperatures.

Shallow water depths and lack of pool habitat were noted in the 1993 surveys. The low number of pools and lack of depth is directly related to low wood levels (6 pieces/100m). Wood is the primary creator of pool habitats in this stream type. Low wood levels appear to be natural as streamside buffers of 100' to 120+' were retained during previous timber harvest (see management actions discussion below). FEMAT (1993) showed that the probability that a falling tree will enter the stream is a function of slope distance from the channel in relation to the tree height. The analysis showed that 100% of wood delivered to streams comes from within one site potential tree height of the stream (150' in Clear Creek). Roughly 95% of the wood subsequently comes from within 120' therefore wood levels in Pine Knob are considered mostly natural. The low wood levels may be due to the dominance of western redcedar that dominates the riparian areas. Redcedar is a long lived species and remains standing for long periods even when dead. Water depths and pool habitat availability are considered to be trending upward trend since buffers were retained and would provide both the short and long term wood necessary to create pools as trees die and fall into the stream. Previously harvested areas that occur within current RHCAs are forested. Standard RHCAs are expected to be retained during the next harvest rotation which would maintain the necessary wood component over time, thus maintaining the upward trend.

Stream bank stability was noted as good to excellent in both the1988 and 1993 surveys. This is due to the presence of dense streamside vegetation in combination with large substrate (cobble, rubble, boulders) which armors the banks against the erosive power of the stream. Bank stability remained in good to excellent condition based on 2010-2012 field observations which showed the same heavily vegetated banks and riparian areas as well as a dominance of cobble substrate.

Stream substrate composition in Pine Knob in 1988 was composed of 38% fine material (sand/silt <6mm), 20% gravel and 42% large material (rubble to boulders). Surveys in 1993 showed a decrease in fine material to 27%, an increase in gravel to 30%, and the same amount of large substrate at 43%. This would indicate an improving trend in larger substrate size and decrease in fine substrate. Although there was an improvement in composition, the cobble embeddedness levels are static as they were measured at 44% in both 1993 and in 2012. Embeddedness was measured in the same stream reach during both surveys. There was one road related failure that was deposited in Pine Knob Creek; however it occurred prior to the 1993 survey. No other obvious sources of sediment were observed at road crossings or along roads within the watershed during 2010-2012 field reviews nor were any other potential management-related sources. As noted by Sylte and Fischenich (2002) cobble embeddedness exhibits high spatial and temporal variability in both natural and disturbed streams. Sampling must be intensive within streams or stream reaches to detect changes. Intensive sampling has not occurred within the drainage so determining a trend for embeddedness based on two surveys may not be appropriate.

Regeneration timber harvest activities have occurred on 36% of the watershed between the 1960's and 1988. No regeneration harvest has occurred since then. Commercial thinning occurred on 11% of the area between the 1970's and 2005. As a result ECA is currently at 3%, or a high condition. Streamside buffers were retained on all but 0.5 miles of stream in the upper portion of the drainage. Forested stands within what are now RHCAs are aged as follows: 6% are < 40 years old, 19% are between 40 and 100 years and the remaining 75% older than 100 years. The RHCAs therefore would be considered fully functional given the age classes and minimal disturbance within them. As a result, they are trending in an upward condition and would continue to provide for shade, wood, and bank stability in Pine Knob Creek.

There are almost 20 miles of Forest system roads within the watershed with less than 2 miles occurring within RHCAs. A total of 0.5 miles of the RHCA roads are graveled and opened to motorized traffic and the remaining are closed. Gravel helps to minimize sediment production from roads (Swift, 1984: Burroughs and King, 1989) as does minimizing motorized use on roads. There were no obvious signs of road surface erosion (no rilling or gullying) during culvert inventories in Pine Knob Creek. Many roads were dominated by a base rock surface topped with grasses/mosses and small trees growing along their margins. The overall watershed road density is 4.8 mi/mi^2 and the RHCA road density is 2.2 mi/mi^2. This is an 11% reduction from densities in 1995 and is a result of past road decommissioning projects. Prior to 2014, there were 11.5 miles of non-system roads in the prescription watershed. The Clear Ridge project decommissions all but 0.5 miles resulting in an almost elimination of these roads and the conversion of 44 acres (4 acres/mile) of road back into productive forested habitats.

There are 9 stream crossings within the watershed with 8 occurring on very small seeps or streams. Two of the crossings were identified as needing cross drain additions and 3 need to be replaced as they are undersized or are in poor condition. Ditchlines in the drainage were well vegetated which help to filter out sediment to streams. There are no human caused barriers to upstream aquatic organism migration in the watershed.

In summary, Appendix A Guidance (Conroy an Thompson, 2011) states that "…In previously degraded watersheds, especially those identified as below objective in 1987, if there have been no entries or natural disturbances over the past 10 to 20 years, it could be assumed that trend is either static or improving." A total of 10 acres of commercial thinning occurred in Pine Knob in the last 10 years (2005) and full PACFISH RHCAs were retained. It has been 27 years since any regeneration harvest has occurred. The lack of recent timber harvest combined with few stream crossings, past road decommissioning projects, mostly closed roads and no obvious sources of sediment other than a pre-1993 road failure would indicate that Pine Knob Creek is experiencing an upward trend. The stream has an excellent and fully functioning riparian vegetation component, stable banks, cool stream temperatures, and increasing amounts of gravel which would allow for the continued improvement of fish habitat capacity over time.

3.1.5.4.2 Clear Creek Prescription Watershed

The 7,234 acre Clear Creek Forest Plan prescription watershed does not meet its water quality objective of 90% for fishery habitat potential. Cobble embeddedness was measured at 38% in 2012. When assessed against the DFCs (USDA, 1992), the watershed currently is at 75% of habitat potential. It was at 50% of its habitat potential when the Forest Plan was written in 1987. This would be considered an upward trend based on fishery habitat potential.

There are about 11 miles of fish-bearing and 17 miles of non-fish bearing streams in Clear Creek. The stream is suitable for chinook salmon, steelhead trout and westslope cutthroat trout. All three species have been found in in the stream during 1984 and 1993 surveys.

Stream temperatures were measured in Clear Creek near Pine Knob in the summer of 2011and 2012. Stream temperature conditions based on NOAA matrix ratings were High for steelhead spawning and rearing (11°C and 13.1°C respectively). Relatively cool temperatures are a result of well forest areas adjacent to streams (see RHCA discussion below). Temperatures were moderate for bull trout rearing (13.1°C) and low for bull trout spawning/incubation (10.1°C). This is consistent with the Climate Shield model results (Isaac, 2014) which showed only a 9% probability of bull trout presence on 1.6 miles of headwater stream in 1980 and a zero percent probability in 2040. Summer water temperatures are considered to be warmer than preferred for bull trout.

Stream bank stability was noted as good to excellent in the1988 surveys. This is due to the presence of dense streamside vegetation in combination with large substrate (cobble, rubble, boulders) which armors the banks against the erosive power of the stream. Bank stability remained in good to excellent condition based on 2010-2012 field observations which showed the same heavily vegetated banks and riparian areas as well as a dominance of cobble substrate.

Stream substrate composition in Clear Creek in 1988 was composed of 12% fine material (sand/silt <6mm), 2% gravel and 86% large material (rubble to boulders). Cobble embeddedness was 38% in 1988 below the Middle Fork and was 38% near Pine Knob Creek in 2012. No obvious sources of sediment were observed at road crossings or along roads within the watershed during 2010-2012 field reviews. As noted by Sylte and Fischenich (2002) cobble embeddedness exhibits high spatial and temporal variability in both natural and disturbed streams. Sampling must be intensive within streams or stream reaches to detect changes. Intensive sampling has not occurred within the drainage and surveys were not conducted in the same location between years. Determining a trend for embeddedness is therefore not possible given available data.

Pool-to-riffle ratios were noted as good (52:48) in the 1988 surveys of the mainstem below the Middle Fork. Surveys also noted low wood levels that were a result of the 1931 fire in that area. Surveys were not conducted in the upper reaches of the watershed. More recent observations in 2012 showed well vegetated riparian areas and buffer retention along streams adjacent to harvest units (see harvest discussion below). Riparian areas, and therefore wood levels, are trending up and would continue over time as intact riparian areas would provide the necessary wood component to streams over time.

Regeneration timber harvest activities have occurred on 15% of the watershed between the 1970s and 1990s. No regeneration harvest has occurred since then. Commercial thinning occurred on 11% of the area between the 1980s and 1990s. Buffers of 150'+ along the mainstem of Clear Creek, and 50+' on the smaller tributaries were retained during harvest beginning in the 1970s. As a result ECA is currently at 3%, or a high condition. Forested stands within what are now RHCAs are aged as follows: 13% are < 40 years old, 20% are between 40 and 100 years and the remaining 67% older than 100 years. The middle age classes are partly a result of a wildfire which occurred in 1931 and burned roughly 23% of the area. The RHCAs therefore would be considered fully functional given the large percentage of older age classes and minimal disturbance within them. As a result, they are trending in an upward condition and would continue to provide for shade, wood, and stable banks in Clear Creek.

There are 26 miles of Forest system roads within the watershed with 2 miles occurring within RHCAs. A total of 0.5 miles of the RHCA roads are graveled and opened to motorized traffic and the remaining are closed. The overall watershed road density is 2.3 mi/mi^2 which is a 16% reduction in roads since 1995 and is a result of past road decommissioning projects. The RHCA and landslide prone road densities are 0.8 mi/mi^2 and 0.04 mi/mi^2, respectively. Prior to 2014, there were 16.5 miles of non-system roads in the prescription watershed. The Clear Ridge project decommissioned all but 0.2 miles resulting in an almost elimination of these roads and the conversion of 65 acres of road back into productive forested habitats.

There are 27 stream crossings within the watershed, 3 of which occur on fish bearing streams and which are not barriers to aquatic organism passage since they were replaced in 2012/2013. A total of 17 culverts are appropriately sized and the remaining 10 crossings are undersized for the area they drain. All roads also cross perpendicular to the stream channels which limit their effects to riparian vegetation; however portions of the ditchlines leading to those crossings are draining directly into the streams. These may be acting as a chronic sediment source of sediment to streams. Ditchlines leading to the 3 fish bearing crossings currently have cross drain pipes installed and are no longer adding sediment to streams at those sites.

In summary, no harvest has occurred in the Clear Creek prescription watershed in the last 21 years. The lack of recent timber harvest combined with intact RHCAs, low RHCA road densities, no fish passage barriers, mostly closed roads, and past road decommissioning and culvert replacement projects would indicate that Clear Creek is experiencing an upward trend. The stream has an excellent riparian vegetation component, stable banks, and cool stream temperatures which would allow for the continued improvement of fish habitat capacity over time.

3.1.5.4.3 Middle Fork Clear Creek Prescription Watershed

The 4,025 acre Middle Fork Clear Creek Forest Plan prescription watershed does not meet its water quality objective of 90% for fishery habitat potential. Cobble embeddedness was measured at 50% in 2014. When assessed against the DFCs (USDA, 1992), the watershed currently is at 59% of habitat potential. It was at 50% of its habitat potential when the Forest Plan was written in 1987. This would be considered an upward trend in fishery habitat potential.

There are about 7 miles of fish-bearing and 13 miles of non-fish bearing streams in Middle Fork Clear Creek. The stream is mostly suitable for steelhead trout and westslope cutthroat trout which were both observed during 1984 and 1993 surveys. The stream provides limited habitat for steelhead trout due to moderate to high stream gradients and limited areas of suitable spawning substrate.

Stream temperatures were measured in Clear Creek in the summer of 2011. Stream temperature conditions based on NOAA matrix ratings were High (good) for steelhead spawning and rearing (10.7°C and 13.6°C respectively). Relatively cool temperatures are a result of well forest areas adjacent to streams (see RHCA discussion below). Temperatures were moderate for bull trout rearing (13.6°C) and low for bull trout spawning/incubation (10.2°C) based on Matrix ratings. This is consistent with the Climate Shield model results (Isaac, 2014) which showed only a 14% probability of bull trout presence on 1.4 miles of headwater stream in 1980 and a zero percent probability in 2040. Summer water temperatures are considered warmer than preferred for bull trout.

Shallow water depths and lack of pool habitat were noted in the 1993 surveys. The low number of pools and lack of depth is directly related to low wood levels (28 pieces/100m). Low wood levels appear to be natural as streamside buffers were retained during previous timber harvest (see regeneration harvest discussion below). Water depths and pool habitat availability are trending upward since buffers were retained and would provide both the short and long term wood necessary to create pools as trees die and fall into the stream. Previously harvested areas that occur within current RHCAs are forested. Standard RHCAs are expected to be retained during the next harvest rotation which would maintain the necessary wood component over time, thus maintaining the upward trend.

Stream bank stability was noted excellent in 1993. This is due to the presence of dense streamside vegetation in combination with large substrate (cobble, rubble, boulders) which armors the banks against the erosive power of the stream.

Stream substrate composition in Middle Fork Clear Creek in 1993 was composed of 26% fine material (sand/silt <6mm), 25% gravel and 49% large material (rubble to boulders) using Wolman pebble counts. Cobble embeddedness was measured at 55% in

1993 and 50% in 2014. This would indicate a slight improvement in cobble embeddedness. No obvious sources of sediment were observed at road crossings or along roads within the watershed during 2010-2012 field reviews. As noted by Sylte and Fischenich (2002) cobble embeddedness exhibits high spatial and temporal variability in both natural and disturbed streams. Sampling must be intensive within streams or stream reaches to detect changes. Intensive sampling has not occurred within the drainage so determining a trend for embeddedness based on two surveys may not be appropriate.

Regeneration timber harvest activities have occurred on 18% of the watershed between the 1970's and 1980s. No regeneration harvest has occurred since then. Commercial thinning occurred on 9% of the area between the 1970's and 1990s. As a result ECA is currently at 2%, or a high condition. About 6% of what are now RHCAs were affected by past timber harvest. Streamside buffers were retained on all units with the exception 2 small headwater streams. Forested stands within the RHCAs are aged as follows: 7% are < 40 years old, 54% are between 40 and 100 years and the remaining 39% older than 100 years. The RHCAs therefore would be considered fully functional given the age classes and minimal disturbance within them. As a result, they are trending in an upward condition and would continue to provide for shade, wood and bank stability in Middle Fork Clear Creek.

There are almost 15 miles of Forest system roads within the watershed with less than 2 miles occurring within RHCAs. All RHCA roads are graveled and are open to either seasonal or year round motorized traffic. The overall watershed road density is 2.4 mi/mi^2 which is a 12% reduction in roads since 1995 and is a result of past road decommissioning projects. RHCA road density is 0.9 mi/mi^2 and landslide prone density is 0.08 mi/mi^2. Prior to 2014, there were 7.2 miles of non-system roads in the prescription watershed. The Clear Ridge project decommissioned all but 0.3 miles resulting in an almost elimination of these roads and the conversion of 28 acres of road back into productive forested habitats.

There are 13 stream crossings within the watershed, 2 of which are on fish bearing streams and are passable to aquatic organisms. Four other crossings have been identified for replacement and these plus an additional 2 require cross drain additions. Roads are expected to be contributing very little sediment to streams due to an overall low number of crossings, low RHCA densities, and the need for the replacement of only 4 crossings.

In summary, no harvest has occurred in the last 23 years. The lack of recent timber harvest combined with relatively few stream crossings, low RHCA road densities, intact RCHAs, stable banks, and cool temperatures would indicate that Middle Fork Clear Creek is experiencing an upward trend. These combine to allow for the continued improvement of fish habitat capacity over time. Effectiveness of Design Features

As noted in Chapter 2, several design features have been proposed to reduce the potential effects of activities on the aquatic resource. These design features have been demonstrated as effective as described below.

PACFISH RHCAs

All management activities since 1995 have implemented PACFISH buffers in order to eliminate or reduce impacts to riparian areas and streams. With no new large disturbances in RHCAs, no long term negative changes to the measured habitat parameters are expected to result from more recent management activities. Various field reviews and monitoring activities support the conclusion that the habitat conditions have improved since the writing of the Forest Plan in 1987 (see Existing Condition section). Much of the recovery is likely a result of fewer land-disturbing activities, better application of BMPs, RHCA retention, and better road design (USDA Forest Service 2009a, p. 91). Preliminary monitoring results from the PIBO monitoring across the Upper Columbia River Basin indicate improving trends in pool depth, bank stability, large wood frequency and volume, and the presence of spawning substrate (<3 inches in diameter) as a result of PACFISH implementation (USDA Forest Service 2009a). Significant decreases in the percent of fine substrates in pool tailouts has also been observed in managed watersheds. Local monitoring of 23 miles of RHCAs and 5.5 miles of temporary road after timber harvest and burning of the units was completed on the Lochsa District in 2014 (USDA Forest Service, unpublished data). There was no evidence of sediment moving from harvest units into RHCAs or sediment moving from temporary roads into harvest units or buffers. The thick vegetation that makes up RHCAs acts as an excellent, virtually impenetrable, filtering source for overland sediment flow. Retaining downed woody debris within the harvest units also provides structures that capture sediment and slow or stop its movement down the slope.

No-harvest buffers of 100–150 feet adjacent to timber sales have been shown to be adequate in protecting the riparian vegetation necessary to maintain natural stream temperature levels (Anderson and Poage, 2014; Ott et al. 2005; Lee et al. 2004; Sridhar 2004; FEMAT 1993). PACFISH buffers greatly exceed these guides on fish bearing streams and meet the guides on non-fish bearing and intermittent streams.

Best Management Practices (BMPs) would be followed for all action alternatives as stipulated by the Idaho Forest Practices Act. Idaho water quality standards regulate nonpoint source pollution from timber management and road reconstruction activities through the application of BMPs. The adjacent Clearwater National Forest has an excellent record of successful implementation of BMPs. Between 1990 and 2002, the Forest had a BMP implementation rate of 98% and a 97.8% rate of effectiveness (USDA Forest Service 2003). Survey results from 2004 through 2008 indicate implementation and effectiveness rates of 98% or greater. These reports can be found in the project file. The same BMPs would be applied to the project and are expected to have similar results.

Road Work

Road reconditioning includes brushing, blading, and spot surfacing roads with gravel where needed. Blading and rocking is done to provide an even and reinforced running surface that can withstand truck traffic. Cleaning ditches and adding cross drains can also occur to maintain or improve drainage. Overall these activities are considered beneficial to water quality (Burroughs 1990; Grace and Clinton 2006; Switalski et al. 2004; Swift and Burns 1999). NOAA stated that surface graveling has been shown to be effective at reducing erosion from road surfaces, especially at road/stream crossings. Foltz (2008) showed that the use of high quality aggregate (gravel) produced 3 to 17 times less sediment than marginal quality aggregate. The basalt aggregate used for the Clear Creek project roads is composed of basalt which is considered high quality as it does not easily break down into smaller, dust forming particles. A study by Swift (1984) showed that placement of a 6-inch lift of 1.5-inch minus crushed rock reduced sediment production by 70% from the unsurfaced condition over a 5-month period. The gravel achieved this amount of protection even though this period included 6.46 inches of rainfall in 5 days. In 13.3 months, the gravel with established grass at the margins of the traveled way reduced sediment production by over 84% compared to 9.5 months when the road was unsurfaced; *[cited in Burroughs and King 1989]*.

Road reconstruction includes adding cross drain culverts near flowing streams in order to divert ditch water and its associated sediment onto the forest floor instead of into the stream. Damian (2003) found that installation of cross drains at optimum sites reduced sediment delivery by 76%. The most important location for a cross drain was within 100–200 feet from a stream crossing. A number of studies have also shown that roads can affect the volume and distribution of overland flow and alter channel network extent, pattern, and processes (Harr et al. 1975; King and Tennyson 1984; Montgomery 1994; Jones and Grant 1996; Wemple et al. 1996, 2001 *[cited in Croke, et al., 2005]*). Water control structures, such as ditches with relief culverts, broad based dips, water bars, and turnouts, are used to drain insloped road surfaces and minimize the travel length of overland flow (Keller and Sherar 2003); such that, increasing number of cross-drains reduces drainage area that collect water, reduces erosion, and hydrologic connectivity of road segments to streams *[cited in Brown, et al., 2013]*.

Road reconstruction also includes the replacement of existing culverts at live stream crossings that are sized for a 100-year flow event. Culverts sized to handle these events are less likely to plug with debris and fail when compared to smaller pipes.

Dust abatement on log haul roads is designed to minimize the amount of road related sediment (via fugitive dust and road surface erosion) added to streams. A 1993 study by Sanders and Addo showed that dust abatement produced half the amount or less of dust as untreated graveled roads. They also showed that traffic speeds affect the amount of dust produced. Slower traffic speeds (20–30 mph) produce half as much dust as higher speeds (40+ mph). Log haul traffic speed is not expected to exceed 30 mph and would be closer to 20 mph due to the narrow, twisty road network in Clear Creek.

3.1.6 Environmental Consequences

3.1.6.1 Direct and Indirect Effects

As noted above, the analysis area for the direct and indirect effects of the alternatives is the project area.

Alternative A—No Action

No logging, no road decommissioning, and no culvert replacements, additions, or removals would occur under the No Action Alternative. Any watershed improvement activities (culvert replacements/removals through road reconditioning/reconstruction and decommissioning) would require additional NEPA analysis prior to implementation.

No direct effects to streams would result from the No Action Alternative, since no stream channels or streamside areas would be disturbed.

The indirect effects include the following:

- Roads needed for future management that may be contributing sediment to streams would continue to do so until further NEPA is completed and funding is obtained to improve them. Culverts would remain undersized, and ditchlines would remain connected to streams. Twenty miles of roads, all within RHCAs, would be maintained in the moderate-risk category for sediment entering streams from ditchlines. Roughly 69 crossings would remain at risk for failure due to retention of undersized culverts. An estimated minimum of 140 tons (equivalent of 10 dump truck loads) of soil could be delivered to a stream in the event of one crossing failure. Crossing failures and the lack of additional cross drains on the roads in in Pine Knob, Middle Fork, and mainstem Clear Creeks could result in a Forest Plan downward trend in sediment. The risk is low in Pine Knob Creek and mainstem Clear Creek due to few stream crossings and limited access. The risk is moderate in Middle Fork Clear Creek due to a higher number of stream crossings and year round access on Forest Road 286.
- The 3.2 miles of NFS system roads proposed for decommissioning within RHCAs could continue to deliver sediment to streams through road surface erosion or future failure. A total of 17 stream crossings are associated with these roads. The risk is considered low for all but 1 mile of road. The 1 mile of NFS road 77781 at the head of Big Cedar Creek has the highest risk of effects because it runs adjacent to the stream and occurs within 150 feet of it on average. Overall RHCA road densities on National Forest lands would remain at 1.4 mi/mi^2.
- No management-related changes, either positive or negative, would occur in the existing aquatic habitat condition. Instream and riparian processes of habitat development and wood recruitment would continue in the project area. Riparian habitat conditions would continue to improve as growing, aging trees gradually provide shade and large, woody debris to streams.

Alternative A would inhibit the ability of the Forest to further limit or reduce sediment delivery to streams from roads in order to meet or maintain Forest Plan water quality objectives. Roadside ditches would continue to deliver sediment to streams indefinitely due to a lack of cross drains. In the event of stream crossing failures, this alternative has the potential to affect the Idaho state standard for cold water aquatic life and salmonid spawning (i.e., beneficial uses). The risk of crossing failures increases as culverts age and their conditions deteriorate.

Alternatives B, C, and D

Design features would be used to minimize direct input of sediment to streams from management activities. RHCAs would be retained on perennial and intermittent streams adjacent to timber harvest units. Temporary roads would be built along or near ridgetops with no stream crossings. Road reconstruction and reconditioning would install cross-drain culverts or drivable dips to divert roadside ditch flow onto the forest floor instead of into streams. Road surfacing with gravel on both reconditioned and reconstructed roads would also occur where needed to minimize sediment production and delivery to streams. Road decommissioning would remove all perennial and intermittent stream channel crossings and would recontour roads within RHCAs. No prescribed fire would be ignited within RHCAs, though low-intensity fire would be allowed to back into them. Grassland improvement activities would occur outside of RHCAs.

Few *direct effects* would occur to fish or their habitat from implementing the action alternatives, due to the following:

- RHCA retention would prevent any direct effects to fish or their habitat from timber harvest, precommercial thinning, or prescribed fire activities taking place under the action alternatives. All vegetation would be retained within the RHCAs. Data have shown that buffers are adequate to prevent sediment input into streams (USDA Forest Service 2006b; Ott et al. 2005; Lee et al. 2004; Sridhar 2004; FEMAT 1993; Clearwater National Forest Annual Monitoring Reports 1998–2009; K. Smith, personal observations; USDA Forest Service, unpublished data, 2014). All potential instream and riparian woody debris would be retained, and no streamside vegetation would be removed. No disturbance would occur in riparian areas or stream channels during timber harvest, and past monitoring indicates that little disturbance would be expected from prescribed fire. The lack of effects would allow for the continued upward trend in Pine Knob, Middle Fork, and mainstem Clear Creek which do not currently meet their Forest Plan water quality sediment objectives.
- Road decommissioning in all the action alternatives would remove 3.2 miles of roads from RHCAs, and all affected areas would be fully recontoured. This decommissioning would result in a 16% reduction in RHCA road miles and the removal of an estimated 8 stream crossings. Decommissioning would return 13 acres of RHCA back into a forested state over time. Road densities in RHCAs on National Forest lands would be reduced to 1.0 mi/mi^2, which would move the watershed condition category from moderate to good, as defined by NOAA (1998).
- Road reconstruction would replace 69 undersized culverts with culverts sized for a 100-year flow event. Cross-drain culverts would also be installed in ditchlines in order to divert ditchline flow away from the streams. Road reconditioning would only add or replace cross drain culverts. No live water is involved in the cross drain work.
- Road decommissioning and replacement of undersized culverts are the only activities that would directly affect streams. Instream activities during culvert removals and replacements would introduce locally measurable amounts of sediments immediately downstream of the sites. The sediments and increased turbidity levels would settle out downstream; the distance is expected to be

less than 600 feet (based on past monitoring) due to small stream size and low flow during the dry season, when work would occur. On very small streams (<18”) or seeps the distance is expected to be less due to very low stream flows and therefore a very low downstream delivery potential. This disturbance may degrade substrate conditions, as fine sediments deposit over existing gravels. However, sediment input would occur over a short time frame (1 day or less per site). The estimated amount of sediment potentially added to a stream from culvert removal is less than 20 pounds (0.01 tons) per site (Foltz et al. 2008). The majority of turbidity associated with culvert removals/replacements is associated with the disturbance of existing instream sediment. Very limited amounts of new sediment are added to the stream due to design feature (BMP) implementation. No direct effects to threatened or sensitive aquatic species would occur, as none of these species are known to reside within a minimum of 1,000 feet of any of the removal/replacement sites. Culvert removals would provide a direct benefit to all aquatic species by eliminating the risk of future crossing failures.

- Culvert removal and replacement would remove about 0.1 acres of riparian vegetation at each site. Removing primarily shrubs and small trees is unlikely to cause stream temperature increases, because the area affected is small (estimated to be <10 acres for all sites combined). Streams are small (<24 inches wide) at all but one site and have very low flows during the summer when work would occur. No measurable changes to stream temperatures are expected at these sites because all are well shaded by dense vegetation (shrubs/trees) above and below the sites. The only wide site occurs on a tributary to Brown Springs Creek and is 9 feet wide. Temperature could increase but it is unlikely due to a well vegetated stream both above and below the removal site.
- No direct effects to streams would occur from road reconditioning where culverts are not replaced, no culverts ext, or during cross-drain culvert installation activities since no stream channels would be disturbed. Cross-drain culverts would be installed an average of 50 to 100 feet away from stream channels, and no mechanism is present to deliver sediment to streams from this activity.
- No direct effects to streams and threatened or sensitive aquatic species would occur from temporary road construction activities since all roads would be located on or near ridgetops where there are no stream crossings and would be decommissioned after use. There are no delivery mechanisms for sediment from temporary roads to be delivered to streams. Decommissioning results in a bumpy texture in the road with woody material spread over it. Based on recent monitoring of temporary roads on the Clearwater NF (USDA Forest Service, unpublished data from 2014) no mechanisms are present that could deliver sediment into stream channels from these roads; PACFISH buffers and vegetation and woody debris left within harvest units act as barriers to potential sediment delivery. The action alternatives would not directly affect Idaho State standards for cold water aquatic life, secondary contact recreation, or salmonid spawning.

The indirect effects to fish or their habitat from implementing the action alternatives would be minimal to beneficial because of the following:

- No indirect effects to streams or fish species would occur from timber harvest or temporary road construction. RHCAs are effective at preventing sediment delivery to streams from these activities. They are also effective at maintaining stream temperatures (see Effectiveness of Design Features previously discussed).
- Detectable effects to stream channel stability at the prescription watershed level are not expected as a result of increased water yield (see Regulatory Compliance Section below and the Biological Assessment ROD Attachment 2 Errata). Stream channel stability is rated as good in the majority of project area streams due to large stream size, large substrates and well vegetated streambanks. The combination of these stream conditions combined with BMP implementation are expected to minimize the risk of effects to stream channel stability.
- Monitoring of other projects indicates that no indirect effects should be expected from low-intensity prescribed fire that would be allowed to back into RHCAs. This type of fire does not typically make its way to riparian areas or streams due to dense tree canopies and high relative humidities, which slow fire movement.
- No indirect effects to (pool frequency, water temperature, large woody debris, bank stability, lower bank angle, and width-to-depth ratio; i.e., PACFISH RMOs) are expected, because riparian areas would not be disturbed. As noted in the Watershed section, water yield is not expected to increase to the point where it would decrease bank stability, and sediment yield would not increase sediment delivery to the point where it would affect width-to-depth ratios.
- Road decommissioning would remove 8 crossings and the fill material associated with them. The removals could add 160 pounds (0.08 tons) of new sediment to streams (Foltz et al. 2008). These amounts are considered minimal when compared to the 40 stream miles over which the sediment may be deposited. The sediment would be expected to flush out of the system within 1 to 2 years (Cissel et al. 2013; Luce and Black 2001; MacDonald 2005). The removals would eliminate the risk of crossing failures at these sites and subsequent input of a minimum of 1,120 tons of soil into streams. Decommissioning would provide for long-term indirect beneficial effects to streams and fish species. Decommissioning RHCA roads would contribute to the upward requirement as required by the Forest Plan for Pine Knob, Middle Fork, and mainstem Clear Creek.
- Road reconstruction under all action alternatives would reduce the risk of sediment delivery to streams. Culverts would be replaced and cross-drain culverts installed at 69 stream crossings under all the action alternatives. These activities would add about 0.7 tons (1,380 pounds) of sediment to the watershed. The amounts are considered minimal when compared to the

65 miles of stream over which the sediment may be deposited. The replacements would greatly reduce the risk of future crossing failures and subsequent input of a minimum of 9,660 tons of soil into the watershed. After project activities are complete, no undersized culverts would remain on NFS lands. New cross-drain culverts would intercept ditchline flow and route sediment away from stream channels. Preliminary monitoring of similar pipes in the Fan Creek drainage on the Lochsa Ranger District indicates that the risk of sediment entering streams after the work is complete would be almost nonexistent (K. Smith, personal observation, 2008). Monitoring showed that only 1 out of 37 pipes routed ditchline flow down the forested slope and into a stream channel. A different design on that one pipe would have prevented any routing to the stream. The remaining pipes routed sediment for an average of 40 feet downslope from the culvert outlet, with no delivery to streams. Road reconstruction activities would allow for a continued improving trend that could help to meet or maintain Forest Plan desired sediment conditions in Clear Creek and its tributaries.

Road reconditioning could indirectly add sediment to streams through surface erosion after blading and delivery via roadside ditches. The factors affecting the amount include the roads slope, surfacing materials, the amount of traffic, and contributing road area when combined with rainfall intensity/duration and snowfall (MacDonald and Coe, 2008). The risk of delivery is expected to be low due to the location of the roads mostly near ridgetops, very few streams with very low flows and BMP implementation including cross-drain culvert or drivable dip installation. The zone where erosion could enter streams typically lays between the cross drain on each side of the stream and the live stream crossing itself. This equates to about 200’ of road length for each crossing. There are an estimated 50 crossings over which blading could occur on reconditioned roads. This equates to about 2 miles of road over the entire project area where sediment could be added to streams. Effects from sediment delivery to the crossings on reconditioned roads are expected to be localized and short-term due to the minor amounts of sediment that could be added to these very small streams/seeps. Dust abatement over the crossings is expected to further reduce the sediment delivery potential during log haul as previously discussed. After logging operations are complete, 4 miles of road would remain opened yearlong to motorized use, 16 miles would only be opened seasonally, and 34 miles would be closed to use. The drainage improvements are expected to minimize sediment delivery over the long term, especially when combined with either limited or no motorized used after the project is complete on the majority (93%) of roads. The expected effects to fish habitat are expected to be minimal due to the distance away from fish bearing streams (minimum 300’ but most are 1,000 feet or more). The long term effects of cross drain additions would be beneficial when compared to the existing condition.

- Forest Plan required FISHSED modeling indicates minor effects to deposited sediment. Modeled changes for cobble embeddedness increase by 1% to 3%

under all alternatives for all prescription watersheds except Kay Creek. No changes in cobble embeddedness occurred for Kay Creek.

- FISHSED modeling indicates a 1% decrease in summer rearing capacity in all prescription watersheds for all action alternatives. Summer rearing remains above 90% for all watersheds except for Pine Knob (86%), and Middle Fork Clear Creek (79%). Adequate summer rearing would be provided for in all subwatersheds.
- FISHSED modeling shows a 1%–3% decrease in winter rearing capacity for all prescription watersheds under all action alternatives except for Middle Fork Clear Creek which remains unchanged at 15%. Winter rearing capacity ranges from 15% to 50% depending on the watershed.
- Lower Clear Creek Face and Big Cedar Creek prescription watersheds were not assigned fish/water quality objectives or sediment yield guidelines, primarily because most of the area is on private lands; subsequently, no FISHSED models were run for these two prescription watersheds.
- In summary, FISHSED modeling predicts a 0%–3% change in cobble embeddedness and summer/winter rearing capacity for juvenile steelhead trout rearing in B channel types for the action alternatives. FISHSED is most appropriately used to assess the effects of changes in habitat quality when cobble embeddedness changes are greater than 10% (Stowell et al. 1983). Predicted changes for the proposed actions are less than 10%. No substantial changes in cobble embeddedness and summer/winter habitat rearing capacity are therefore expected based on this modeling and on PACFISH effectiveness monitoring (USDA Forest Service 2009a, 2014) Having no substantial effects to cobble embeddedness would allow for the continued upward trend for fish habitat carrying capacity in Pine Knob, Middle Fork, and mainstem Clear Creek.
- The action alternatives would indirectly result in minor, short-term localized negative effects to cold water aquatic life during culvert removals, replacements, and road blading and ditch pulling. Because these activities are designed to improve conditions over the long term, all state designated beneficial uses would be maintained over the long term.
- There would be long-term (>50 years) positive indirect effects to listed and sensitive fish species as a result of the road-related sediment reduction activities previously discussed. No indirect effects from timber harvest, temporary roads, or prescribed fire are expected. Cobble embeddedness is not expected to measurably increase from management related activities and riparian areas would continue to function naturally from a lack of activities within them. This would allow for improved large wood levels over time that would create pool habitat for salmon and trout species. Stream temperatures would also not be affected due to only minimal activities within RHCAs (culvert removal/replacement).

3.1.6.2 Cumulative Effects

The cumulative effects analysis area is the entire 58,990-acre Clear Creek drainage. It includes all federal, State, and private lands in the watershed. This analysis area was selected since activities outside of the drainage would have no effects on aquatic habitats within the drainage. Quantitative information was available for roads only. Google Earth was used to assess riparian conditions and the analysis is presented in qualitative form.

The time frame considered for cumulative effects is 2015 to 2022. This period covers all road reconditioning/reconstruction and decommissioning activities from the beginning of the project until 2 years after these activities are expected to be completed. The additional 2 years after project completion is the expected amount of time it would take for shrubs and ground cover to respond after culvert replacement or decommissioning activities occur. The growth of shrubs and other ground cover limits overland flow of sediment after these activities.

This analysis considers only those activities that affect road densities, culvert size, or cobble embeddedness levels (as modeled by FISHSED) during the cumulative effects time frame as these are directly related to the issue indicators assessed above.

Grazing on federal lands was not considered due to the limited effects to streams observed since 2010. There are 175 cow/calf pairs allowed in the area (average 250 acres per pair) with seasons of use between June 1 and October 30. Field observations by the project Fisheries Biologist and Hydrologist noted limited trampling and forage of grasses in very few riparian areas. Most were associated with small flat areas in headwater streams adjacent to roads or at road crossings. There was very little streambank damage observed except at culverts where they obtain drinking water. Out of the 200 culvert sites reviewed, less than 10 had evidence of cow use. Trampling and foraging was light and total vegetation removal was not observed. Reporting by the Range specialists indicate <5% bank disturbance from 2009-2012 (the allotment standard is <10%). Post-season riparian use did not exceed the standard of <35% in all years monitored. Grazing does not appear to be contributing measurable sediment to streams on federal lands as a result. Grazing was not considered on private/state lands as there is limited riparian related and cattle stocking level information available for privately grazed lands. Effects cannot be determined from Google Earth images.

Recreation on trails was not considered since most are non-motorized. All motorized trails are associated with existing roads and considered in the roads portion of this analysis. A review of foot/stock trails at several steam crossings showed little-to-no erosion.

Timber harvest was conducted on 300 acres of state lands in 2013 and an unknown amount of acres on one small privately owned property. These activities were not considered for cumulative effects since harvest in either location would require the retention of Forest Practices Act buffers. This would provide for stream protection and minimize the amount of sediment entering streams from harvest activities. The proposed harvest is on state lands would not be measurable since it occurs on only 0.005% of the watershed. Harvest on private lands is not expected to be measurable since most private properties appear to be owned by non-timber production oriented individuals and acreages tend to be small. Riparian areas within 100 feet of streams on private/State lands in lower Clear Creek are well vegetated along most major stream courses; however Google Earth reveals that the mainstem of Clear Creek lacks overhead cover. This is due to a combination of the 1931 fire which consumed most riparian trees and a wide (35–50 feet) stream channel that is difficult to fully shade. Less than 10% of the mainstem of lower Clear Creek has vegetation on both sides of the stream tall enough to shade it during the hot summer months. Also as the stream drops in elevation, large non-forested openings appear adjacent to the stream. The north and east sides of Leitch Creek and the east side of Clear Creek are constrained by naturally occurring steep, grass-dominated hillslopes and basalt outcrops. The outcrops do not grow trees and therefore cannot provide for stream shading. The streambanks on the lower mainstem of Clear Creek are dominated by willow, alder, Japanese knotweed, grass and are very stable. The overstory, where it occurs, is comprised of cottonwood and mixed coniferous tree species. Japanese knotweed occurs extensively along the banks of the mainstem of Clear Creek. Its thick growing pattern restricts the establishment of large trees which in turn prevents shading opportunities for the creek. While it provides for bank stability, the knotweed itself is not tall enough to provide shade. It is also difficult to eradicate once established therefore riparian shade conditions are not expected to improve where it occurs. Smaller, non-mainstem streams are dominated by shrub understories and mixed conifer overstories that provide some shade to the streams. The reduced vegetation along portions of Leitch and Clear Creeks contributes to warm stream temperatures as noted by past surveys (Nez Perce Tribe 1987) and current data. As previously discussed, stream temperatures in lower Clear Creek exceed those preferred by salmon and trout which in turn affects temperatures at the Kooskia Hatchery. The lower mainstem of Clear Creek exceeds desired temperatures as a result of both natural warming (Groom et al. 2011) and the removal of riparian vegetation (in this case the replacement of trees with knotweed).

There is an estimated 20 miles of road within 100 feet of streams on private/State lands with an associated 23 stream crossings. The Leitch Creek and Clear Creek Roads lie adjacent to these streams and both are paved limiting potential sediment input to streams. Of the stream crossings, 3 on mainstem Clear Creek are known to be bridges. There is no information regarding the remaining culverts or any proposed road work in RHCAs on state or private lands. It is assumed that the culverts are undersized. Past activities on state/private lands include the replacement of 1 culvert on Leitch Creek and 1 on Clear Creek in 2011. Both plugged as a result of flood flows and were replaced with larger, appropriately sized culverts.

The existing condition previously discussed includes all past road building, fish passage culvert replacement, and decommissioning activities through 2013. The activities considered for cumulative effects are proposed project road decommissioning and road reconstruction activities in combination with the Browns Spring Creek Culvert Replacement Project (2013/2014) and the proposed Clear Ridge Non-system Road Decommissioning Project (2015 and beyond).

Culvert inventories found the Browns Spring culverts to be undersized but contain no fish. One was a moderate priority for replacement and the other a low priority. Both will be replaced with structures sized for a 100-year flow event. The Clear Ridge Non-system Road Decommissioning Project would remove about 15 crossings and 8 miles of roads within RHCAs. Decommissioning nonsystem roads would reestablish vegetation on 32 acres of RHCAs. These projects could add locally measurable amounts of sediments to streams, as discussed above under the road decommissioning portion of this analysis. Sediment is not expected to travel more than 600 feet downstream, due to the timing of installation (i.e., during low-flow periods) and BMP implementation to control sediment. Crossing removals are beneficial but are not included in the calculation for stream crossings, because the streams were not surveyed and it is not known if the crossings currently exist. A long-term beneficial effect would be associated with crossing removals.

Alternative A

Lower Clear Creek (on private lands) has 5 appropriately sized stream crossings (3 bridges and 2 culverts) on county roads. Ongoing and future foreseeable federal actions that could increase instream sediment or turbidity levels include the Browns Spring Creek Culvert Replacement Project and the Clear Ridge Non-system Road Decommissioning Project. Under this alternative, those two projects could contribute 340 pounds (0.2 tons) of sediment to Clear Creek or its tributaries. This alternative would cumulatively retain 87 undersized culverts in the watershed. The potential failure risk for these crossings would increase with age. There would be a potential for the addition of 12,180 tons of sediment to be added to the drainage if all 87 culverts failed. The Clear Ridge project would decommission 8 miles of roads in RHCAs; however, road densities would not be affected since nonsystem roads are not included in road density calculations. However, both of these projects would provide a minor beneficial effect from potential sediment reductions to project area streams. No measurable negative cumulative effects to cobble embeddedness are expected based on NEZSED or FISHSED modeling; however effects could occur in the event of multiple culvert failures. The level of effects cannot be determined since it is not possible to determine when culverts could fail.

Stream temperatures would not be affected by ongoing or future foreseeable road decommissioning and culvert replacement activities (see Direct Effects previous discussion above). Stream temperatures would increase naturally in the downstream direction and would continue to warm on private lands where the stream is wide and overhead cover limited. There is a chance that temperatures could decrease slightly as streamside trees in previously burned riparian areas grow to maturity.

Alternatives B, C, and D

The proposed project activities, when combined with past, ongoing and future foreseeable federal activities would cumulatively reduce RHCA road density from 2.7 mi/mi^2 to 2.6 mi/mi^2 at the watershed scale. This improvement would maintain the Clear Creek watershed in the moderate condition class (NOAA 1998). The action alternatives would cumulatively retain 18 undersized culverts in the watershed. Road decommissioning would cumulatively return 45 acres of RHCAs to a forested condition.

No cumulative effects to cobble embeddedness, summer rearing, or winter rearing capacity are expected as FISHSED-modeled changes indicated no measurable (>10%) change in these factors. Culvert replacement, road reconstruction, road reconditioning, and decommissioning activities were modeled in NEZSED and FISHSED and were assessed for cumulative effects related to sediment that may be produced from these activities. Sediment yield would increase to 17% but would not exceed the Forest Plan standard of 30% at the Forest boundary and would drop to below existing levels within 6 years (see "Watershed" section of this document). There would be no long term sediment yield increase as a result. No substantial changes to cobble embeddedness from FISHSED modeling were indicated therefore no cumulative sediment increases to downstream areas of Clear Creek, including the Kooskia Hatchery, are expected. Road decommissioning, reconditioning, and reconstruction activities would provide for long term (>50 years) instream sediment reduction by reducing the risk of road failures where crossings are replaced or removed and cross drain culverts are installed. Undersized culverts on private lands would still pose a failure risk and could contribute sediment to Clear Creek.

Culvert replacement, road decommissioning, road reconditioning, road reconstruction and reconditioning activities would produce short term (less than 5 years) negative effects from sediment input to streams and would have an overall positive cumulative effect to aquatic habitat and species in the project area related to sediment. As noted by NOAA (2005), keeping roads hydrologically disconnected from streams and unstable slopes will reduce water yield effects and delivery of fine sediments to streams. No measurable negative cumulative effects to instream sediment are expected as a result of any of the action alternatives when combined with State/private lands and other projects on federal lands.

No cumulative effects to stream temperatures are expected. Groom et al. (2011) showed that timber harvest on Oregon State managed lands using State forest management standards had a low (8.6%) probability of post-harvest temperatures increases. The state standards required a 25-foot no-harvest zone from the stream and a limited-harvest area from 25 to 170 feet out from the stream. The Clear Creek project would not harvest within 150 feet of non-fish bearing perennial streams and 300 feet of fish-bearing streams. Given that no riparian vegetation would be harvested, no stream temperature increases are expected, therefore there would be no cumulative effects to temperatures downstream on private or state lands, and there would be no temperature effect on the Kooksia Fish Hatchery. Temperatures in lower Clear Creek are expected to continue to exceed desired conditions due to natural warming, a wide stream channel, and the lack of shading vegetation (trees) along much of the stream.

3.1.7 Regulatory Compliance

3.1.7.1 Endangered Species Act

Listed steelhead trout are known to occur in the mainstem, West, South, and Middle Forks of Clear Creek as well as Pine Knob Creek. Densities ranged from low to moderate. There are a total of 35 miles of designated critical habitat within Pine Knob, Brown Springs, and Kay Creeks as well as the mainstem, West, South, and Middle Forks of Clear Creek. The retention of RHCAs adjacent to timber harvest units are designed to protect both the fish and their designated critical habitat through the retention of all vegetation. A detailed analysis of effects to listed fish species (steelhead and bull trout, as well as essential fish habitat for salmon) was completed and can be found in the Clear Creek Integrated Restoration Project Biological Assessment and July 2015 errata found in the ROD, Attachment 2.

3.1.7.1.1 Sediment

Potential effects to steelhead or Essential Fish Habitat (EFH—i.e., spring chinook/coho salmon habitat) would result from the addition of sediment into streams from road decommissioning, reconstruction or reconditioning activities. These activities would add pulses of sediment to streams in the short term while culverts are removed/replaced and runoff occurs from ground disturbed areas; however, they would reduce existing sediment delivery in the short and long terms. Road reconditioning and reconstruction are expected to reduce a high percentage of existing road sediment sources and in that way reduce sediment delivery, but at the same time would create newly disturbed roadbeds and ditches and potential for increased sediment delivery. Minimization of that potential increased delivery from reconstruction and reconditioning and road use relies on design features and BMPs including gravelling, cross drains, and dust abatement.

No steelhead trout or EFH occurs within 1,000 feet of the culvert replacement or removal sites; however two culvert replacement sites are within 600 feet of steelhead designated critical habitat on upper Clear Creek. No fish were observed at either site during culvert inventories due to the very small stream size; however they could still be present.The expected net reduction in sediment delivery from roads should allow stream substrates to become less embedded over time. Stream substrate function may thereby improve for steelhead spawning, incubation, emergence, and rearing; and survival and production of steelhead in Clear Creek could generally increase due to the proposed action. Small localized and short-lived decreases in substrate condition caused by culvert work, and by reconstructed/reconditioned sections of road and road use near streams are expected. Those site specific sediment additions may temporarily decrease habitat use and possibly an increment of steelhead production in small portions of the project area for 1-4 years. Short term, localized sediment deposits are expected to dissipate quickly in the presence of fewer chronic sources. Reduction in chronic sources will occur through past and proposed road decommissioning, and through the elimination or reduction of existing sediment sources.

3.1.7.1.2 Water Yield

The following summarizes the potential effects to water yield from proposed activities. Please see the Watershed Section of this document for more detailed information.

Canopy removal from timber harvest and road building has the potential to cause changes to streamflow and water yield. An analysis of effects to streamflow from timber harvest based on equivalent clearcut acres (ECA) was conducted because they have concentrations of regeneration harvest, high intrinsic spawning, and rearing potential, and steelhead presence. This analysis was conducted on Upper Clear Creek, South Fork Clear Creek, and Hoodoo Creek subwatersheds. These are the same HUC6 watersheds as those identified in the 1998 Biological Opinion for Steelhead and Salmon in the Upper Columbia and Snake River Basins (NOAA, 1998). The results of the analysis were compared against the Matrix of Pathways and Indicator (NOAA, 1998) for each of the subwatersheds. The Matrix identifies the following condition: High (good) is defined as ECAs for the entire watershed (HUC5) and all of its subwatersheds (HUC6) being <15%. Moderate conditions are 15-20% for the entire watershed or 15-30% for one or more subwatersheds. Low conditions have ECAs >20% for the watershed and one or more subwatersheds >30%.

ECA for the Clear Creek watershed (HUC5) is 12% for Alternative B, 13% for Alternative C, and 11% for Alternative D. All alternatives maintain the Clear Creek watershed in a high condition based on the Matrix indicator. Under Alternatives B and D ECA would decrease to pre-project levels (4%) after 12 years and under Alternative C it would take 14 years.

For the Upper Clear Creek subwatershed ECA is predicted to increase to 15%, 16% and 14% in under Alternative B, C and D, respectively. Alternative B and C moves the subwatershed from a high to moderate condition based on the NOAA Matrix (1998). ECA increases to 7%, 8%, and 6% in the South Fork of Clear Creek maintaining it in a high condition for all alternatives. ECA increases to 20%, 26%, and 19% in the Hoodoo subwatershed moving it from a high to a moderate category based on ECA.

ECA has the potential to affect water yield. Forest Hydrology, Hydrologic Effects of Vegetation Manipulation, Part II (USDA FS 1974) describes that most 3rd through 5th order drainage channels on the Nez Perce National Forest can sustain a 10% increase in average annual runoff as a result of timber harvest before increases are detectable. Calculations and graphs (from USDA FS 1974) were used to analyze the allowable ECA that would maintain average annual runoff below a 10% increase. These calculations indicate that an ECA of 25% would maintain the runoff to below 10% and therefore any ECA below this amount would maintain water yield below detectable amounts. ECA remains below 25% for the Upper Clear Creek subwatershed and the expected percent increase in average annual water yield for Alternative C is 6%. Proposed activities are not likely to result in detectable changes to average annual flow or stream bank stability. ECA for Hoodoo was calculated at 26% for Alternative C which is above the 25% recommended ECA. The percent increase in average annual water yield for Hoodoo was calculated at 10% which is at the threshold of potential channel changes (Grant et al. 2008). An increase over the recommended 10% in average annual runoff is generally allowed when stream banks are more than 60% stable. Stream habitat surveys from 1988, when combined with field observations from 2010-2012, indicate banks are very stable in the West Fork Clear/Hoodoo Creek subwatershed. About 90% of the surveyed reaches in the subwatershed had well vegetated (90%+) streambanks, substrates dominated by boulders and rubble with some sand (mostly behind debris jams) and large amounts of woody debris (average 23 pieces/100 meters) with many debris jams noted. It is likely that no detectable changes would be noted or would be very minor in this subwatershed due to the stable nature of the banks and the presence of large woody debris which would aid in moderating flows. In addition, as discussed in Grant et al. (2008) water yield effects on channel morphology are generally limited to stream reaches where channel gradients are less than approximately 2% and in which streambeds are composed of gravel and finer substrate material. Gradients in the mainstems ofWest Fork/Hoodoo range between 3 and 10%. The tributaries range from 10% to 82%. Stream substrates are dominated by cobbles, rubble and boulders. Peak flow effects on channel morphology are generally not found on high-gradient (>10%) streams and are minor in most step-pool systems (Grant et al. 2008). It is unlikely that channel morphology changes would be expected in the West Fork/Hoodoo subwatershed as a result of Alternative C.

Because the final ECA or percent increase in average annual water yield percentages are at or below those where detectable changes to peak or baseflow are likely, or channels are well armored with vegetation, rock and wood, steelhead spawning and rearing habitats downstream of proposed activities are unlikely to undergo detectable changes due to harvest related changes in streamflow.

NOAA (2005) conducted a literature review of potential changes in flow from a watershed following timber harvest. This can be summarized as follows: (1) It is difficult to separate streamflow effects of timber harvest from roads but the major influence appears to be from roads; (2) effects from timber harvest are most pronounced in small basins (< a few square kilometers) and in relatively small floods (<1- to 2-year recurrence interval); (3) effects of water yield increases with percent of basin clearcut with detectable changes in yield when over 25% is harvested; (4) forest buffers serve to reduce harvest area and maintain bank stability and resilience to floods; and (5) it is unclear if changes to peak or baseflow from timber harvest alone has significant effects on habitat or salmon populations. Their review suggests that the effects of changes in stream flow from harvest will have negligible effects on salmon as long as (1) roads are kept hydrologically disconnected from the stream system and (2) riparian and floodplain forest functions are preserved. The Clear Creek project would accomplish these through cross drain installation and RHCA retention.

Six of the culvert removal or replacement sites (three in upper Clear Creek and three in South Fork Clear Creek) have or potentially have steelhead present. Fish removal and salvage prior to dewatering the sites could result in harassment, injury, and potential mortality to steelhead at the site. Work would occur during the low streamflow period and blocknets would be used to keep fish out of the work area and to minimize the potential effects to steelhead trout. The potential effects to steelhead are a result of the culvert replacement work. As previously discussed, effects from timber harvest and potential increases in water yield are not expected.

An “adverse effect” is any action that has an apparent direct or indirect adverse effect on the conservation and recovery of a species listed as threatened or endangered. Such actions include, but are not limited to: actions that directly alters, modifies, or destroys critical or essential habitats or renders occupied habitat unsuitable for use by a listed species, or that otherwise affects its productivity, survival, or mortality; or actions that directly results in the taking of a listed species. See Title 50 Code of Federal Regulations, Section 17.3 for an explanation of what constitutes a taking. Take is defined as “harass, harm…wound…or to attempt to engage in any such conduct” (FSH 2670.5). Harass is an act that creates the likelihood of injury by annoying a species to the extent that it significantly disrupts normal behavior patterns including breeding, feeding, or sheltering. Harm is an act that actually injures or kills an individual listed species. Harm also includes actions that modify or degrade environmental conditions that result in direct death or injury.

The project would have long term beneficial effects to steelhead and their designated critical habitat as well as EFH from road removal, culvert replacement, and road reconstruction/reconditioning activities. The risk for potential effects to steelhead trout, designated critical habitat or EFH from road-related project activitiescould occur, therefore the ESA effects determination for the project is **may affect, likely to adversely affect steelhead trout, their designated critical habitat, and EFH**. Any adverse effects to steelhead, their designated critical habitat, or EFH are expected to be minimal due to BMP implementation.

The Clear Creek IR Project is consistent with the 1998 Biological Opinion for Salmon and Steelhead in the Upper Columbia and Snake River Basins in that it applies PACFISH direction and does not prevent the attainment of PACFISH RMOs, conducted a watershed analysis that identified needs to improve habitat for listed steelhead in Clear Creek, and conducted project level Section 7 consultation.

The project **may affect, but is not likely to adversely affect** bull trout since they were only sporadically found in the lower drainage. Temperature regimes are not within desired ranges for bull trout during the spawning migration period. Temperatures at the mouth of the streams create a thermal deterrent during this time. The proposed activities are not expected to directly or indirectly affect the species as a result. The project would allow for the maintenance of natural temperature ranges through PACFISH buffer retention. Modeled sediment yield and cobble embeddedness levels increased from harvest but not to measurable levels. There would be **no effect to bull trout designated critical habitat** since none exists in the drainage.

3.1.7.1.3 Region One Sensitive Species

There would be potential effects to westslope cutthroat trout, redband trout, and spring chinook as a result of road improvement or decommissioning activities. The effects are similar to those discussed for steelhead. The project may therefore impact individuals, but would not lead to their listing under ESA. This is due to the short term increase in sediment as modeled by NEZSED and temporary increases in suspended sediment associated with culvert removals and replacements. The project would have long-term beneficial effects to these species from reduced road-related sediment input to streams.

The project would have no impact on Pacific lamprey or pearlshell mussel as they are not known to occur within the watershed, within close proximity of proposed activities, or would not result in effects to preferred habitats.

3.1.7.2 PACFISH

The project complies with PACFISH in that the project would not retard the attainment of Riparian Management Objectives for bank stability, width to depth ratio, instream large woody debris, pool frequency, or water temperature. Project activities would allow for improvement in large wood, pool frequency, and water temperature overtime as no riparian areas would be harvested. Bank stability would be maintained throughout the drainage as a result of RHCA retention and limited increases in modeled water yield. Road decommissioning and culvert replacements would help to maintain bank stability over the long term by eliminating or greatly reducing the potential for future crossing failures. Stream crossings can destabilize banks downstream for thousands of feet if they fail. Adding cross drain culverts would reduce the potential amount of sediment reaching streams from ditchlines. This would be beneficial over the long term (decades). The project complies with PACFISH standards and guidelines for timber harvest and road-related activities by not conducting timber harvest in RHCAs (Guideline TM-1), minimizing roads in RHCAs (RF-2b), reconstructing road and drainage features to control sediment delivery (RF-3a), obliterating roads not needed for future management (RF-3c), and improving culverts at stream crossings to accommodate a 100-year flow event (RF-4). It also complies with designing burn projects to contribute to the attainment of RMOs (FM-4) and implements watershed restoration that promotes the long-term ecological integrity of ecosystems (WR-1) and contributes to the attainment of RMOs (FW-1).

3.1.7.3 Forest Plan

All action alternatives comply with the Forest Plan Water Quality Objectives and the upward trend requirement. FISHED modeling indicates no measurable changes in cobble embeddedness, summer or winter rearing capacity in any of the prescription watersheds. In addition, road decommissioning and reconditioning/reconstruction activities would reduce potential sediment input and allow streams to continue to trend toward meeting desired conditions for cobble embeddedness, summer rearing and winter rearing capacity. The following discusses the effects of the actions on upward trend in the 3 prescription watersheds that do not currently meet their water quality objectives.

3.1.7.3.1 Upward Trend

All alternatives propose the same actions related to roads including reconditioning, reconstruction and decommissioning as well as culvert replacements. All alternatives would maintain an upward trend therefore Alternative C was the only alternative assessed as it proposes the most harvest and temporary road building.

3.1.7.3.2 Pine Knob Prescription Watershed

The Clear Creek Project would decommission an additional 1.8 miles of road, 0.1 miles of which is within RHCAs. This would reduce watershed road densities to 4.3 mi/mi^2 (9% reduction) and RHCA densities to 2.0 mi/mi^2 (a 6% reduction). The Clear Creek Project would decommission the remaining 0.5 miles of non-system road resulting in the watershed and would convert 2 acres of road back into a forested condition. The Clear Creek Project would reconstruct 8.5 miles of system road (48% of the roads in the prescription watershed) which would help to reduce sediment delivery by diverting road ditchline flow away from streams through cross drain culvert additions. The project would also replace the 2 existing undersized culverts with those sized for a 100- year flow event. This would reduce the risk of future failure. All 8 crossings in the watershed would be appropriately sized after project completion. The Project would recondition 5.8 miles of road (69% of the roads). Reconditioning would apply gravel where needed to minimize the amount of erosion from road surfaces during log haul operations. The use of dust abatement during log haul would also minimize road surface erosion and potential input of sediment to streams.

All of the activities are expected to have a negative effect on aquatic condition in the short term based on sediment yields as modeled in NEZSED. Model results from NEZSED indicate sediment yield increases at the mouth of Pine Knob to 18% as a result of project activities. This is well below the Forest Plan standard of 45%. The FISHSED model was used in conjunction with NEZSED to determine potential changes in fish habitat carrying capacity. The model predicted a 2% increase in cobble embeddedness and decrease in summer/winter rearing capacity for juvenile steelhead trout rearing for the action alternatives. This is well below the 10% where changes in habitat quality could occur (Stowell et al. 1983). No substantial changes in cobble embeddedness and summer/winter habitat rearing capacity are therefore expected based on this modeling and on PACFISH and local effectiveness monitoring (USDA Forest Service 2009b and 2014).

ECAs would increase to 14% under all alternatives and would remain within the High (good) condition class based on the NOAA matrix (1998) therefore no channel alterations as a result of increased water yield is expected.

The current upward trend is expected to continue in the Pine Knob prescription watershed because of road improvements associated with the project, the relatively intact RHCAs, the expected minimal effects of modeled sediment to streams, water yields that would remain below levels where alterations in streams channels could occur, and the implementation of design features and BMPs.

3.1.7.3.3 Clear Creek Prescription Watershed

The Clear Creek Project would decommission an additional 0.6 miles of road in the prescription watershed. This would reduce watershed road densities to 2.3 mi/mi^2, or a 2% reduction. RHCA densities would remain at 0.8 mi/mi^2. The Clear Creek Project would decommission the remaining 0.2 miles of non-system road resulting in the watershed and would convert 1 acre of road back into a forested condition. The Clear Creek Project would reconstruct 2.7 miles of system road (18% of the roads in the prescription watershed) which would help to reduce sediment delivery by diverting road ditchline flow away from streams through cross drain culvert additions. The project would also replace the 10 existing undersized culverts with those sized for a 100- year flow event. This would reduce the risk of future failure. All crossings in the watershed would be appropriately sized after project completion. The Project would recondition 2.7 miles of road (18% of the roads). Reconditioning would apply gravel where needed to minimize the amount of erosion from road surfaces during log haul operations. The use of dust abatement during log haul would also minimize road surface erosion and potential input of sediment to streams.

All of the activities are expected to have a negative effect on aquatic condition in the short term based on sediment yields as modeled in NEZSED. Model results indicate sediment yield increases in Clear Creek near the confluence with the South Fork to 18% as a result of project activities. This is well below the Forest Plan standard of 30%. The FISHSED model was used in conjunction with NEZSED to determine potential changes in fish habitat carrying capacity. The model predicted a 1% increase in cobble embeddedness and 1% decrease in summer/winter rearing capacity for juvenile steelhead trout rearing for the action alternatives. This is well below the 10% where changes in habitat quality could occur (Stowell et al. 1983). No substantial changes in cobble embeddedness and summer/winter habitat rearing capacity are therefore expected based on this modeling and on local effectiveness monitoring (USDA Forest Service 2009b and 2014).

ECAs would increase to between 12% and 15% depending on the alternative and would remain within the High condition class based on the NOAA matrix (1998) therefore no channel alterations as a result of increased water yield is expected.

The current upward trend in streams is expected to continue in Clear Creek because of mostly intact riparian areas, road related activities that are expected to decrease sediment input, water yields would remain below levels where alterations in streams channels could occur, and the implementation of design features and BMPs.

3.1.7.3.4 Middle Fork Clear Creek Prescription Watershed

The Clear Creek Project would decommission an additional 1.3 miles of road in the prescription watershed, 0.1 of which is in RHCAs. This would reduce watershed road densities to 2.2 mi/mi^2 (a 9% reduction) and RHCA densities to 0.9 mi/mi^2 (or a 6% reduction). The Clear Creek Project would decommission the remaining 0.3 miles of non-system road resulting in the watershed and would convert 1 acre of road back into a forested condition. The Clear Creek Project would reconstruct 6.9 miles of system road (51% of the roads in the prescription watershed) which would help to reduce sediment delivery by diverting road ditchline flow away from streams through cross drain culvert additions. The project would also replace the 4 existing and remove 1 undersized culverts with those sized for a 100- year flow event. This would reduce the risk of future failure. All crossings in the watershed would be appropriately sized after project completion. The Project would recondition 3.2 miles of road (24% of the roads). Reconditioning would apply gravel where needed to minimize the amount of erosion from road surfaces during log haul operations. The use of dust abatement during log haul would also minimize road surface erosion and potential input of sediment to streams.

All of the activities are expected to have a negative effect on aquatic condition in the short term based on sediment yields as modeled in NEZSED. Model results indicate sediment yield increases at the mouth of Middle Fork to 11% as a result of project activities. This is well below the Forest Plan standard of 30%. The FISHSED model was used in conjunction with NEZSED to determine potential changes in fish habitat carrying capacity. The model predicted a 1% increase in cobble embeddedness and 1% decrease in summer/winter rearing capacity for juvenile steelhead trout rearing for the action alternatives. This is well below the 10% where changes in habitat quality could occur (Stowell et al. 1983). No substantial changes in cobble embeddedness and summer/winter habitat rearing capacity are therefore expected based on this modeling and on local effectiveness monitoring (USDA Forest Service 2009b and 2014).

ECAs would increase to between 7% and 9% depending on the alternative and would remain within the High condition class based on the NOAA matrix (1998) therefore no channel alterations as a result of increased water yield is expected.

The current upward trend in streams is expected to continue in Middle Fork Clear Creek because of the mostly intact riparian areas, road related activities that are expected to decrease sediment input, and the implementation of design features and BMPs.

3.2 CULTURAL RESOURCES

3.2.1 Analysis Area

The scope of the analysis for cultural resources includes the entire project area and considers the effects of all proposed activities for their potential effects to cultural resources. The cumulative effects area includes the entire proposed project area.

3.2.2 Regulatory Framework

The USDA Forest Service is mandated to comply with the National Historic Preservation Act (NHPA) of 1966 [Public Law 89-665] and its amendments. Section 106 of the NHPA requires that Federal agencies with direct or indirect jurisdiction over Federal, federally assisted, or federally licensed undertakings afford the Advisory Council on Historic Preservation (ACHP) a reasonable opportunity for comment on such undertakings that affect properties included in or eligible for inclusion in the National Register of Historic Places (NRHP) prior to the agency's approval of any such undertaking: [36 CFR 800.1]. Historic properties are identified by a cultural resource inventory and are determined to be either eligible or not eligible by the cultural resource specialist in consultation with the State Historic Preservation Office (SHPO). Sites that are determined to be eligible are then either protected in-place or adverse impacts must be mitigated.

Each cultural property is evaluated against four strict standards in a process to determine that properties historical significance for possible inclusion in the National Register of Historic Places. These criteria address specific elements that may be contained within that specific property. These criteria are found in the Code of Federal Regulations, 36 Part 60.

> **Criteria A:** The quality of significance is associated with events that have made a significant contribution to the broad patterns of our history; or
>
> **Criteria B:** … That are associated with the lives of persons significant in our past; or
>
> **Criteria C: …** That embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
>
> **Criteria D:** … That have yielded, or may be likely to yield, information important in prehistory or history.

3.2.3 Analysis Methodology

The data presented are a result of reviewing existing information available for the proposed project located on Forest Service Managed Lands on the Moose Creek Ranger District of the Nez Perce-Clearwater National Forests. Documents reviewed include previously completed cultural resource inventory reports, historic property site records, historical forest maps, and other historic documents. In accordance with National Historic Preservation Act of 1966, as amended, a cultural resource inventory of the proposed project was completed in 2011, 2012, and 2013. The findings of the inventory would be submitted to the Idaho State Historic preservation Officer (SHPO) for review and concurrence.

3.2.4 Resource Indicators

The indicator used for cultural resources is the number of sites affected by proposed project activities.

3.2.5 Affected Environment

The project area has seen numerous changes in human land use patterns. From its earliest Native American inhabitants who lived in and traveled through the area utilizing its resources, to the families who homesteaded and settled in the area, to the minerals exploration from the mid-1800s into the early 1900s, the region witnessed several waves of occupation through time. Each group interacted with the environment in their own way, extracting various products and manipulating it to their benefit when possible.

There have been four previous cultural resource surveys conducted in the proposed project area. There are thirteen previously documented cultural resource properties located within the boundary of the analysis area. Three of these properties are eligible for the National Register of Historic Places (NRHP), seven sites are not eligible for the NRHP, and three sites are unevaluated for their NRHP eligibility.

3.2.6 Environmental Consequences

The 4 alternatives would have varying effects on the 13 known cultural properties.

3.2.6.1 Direct, Indirect, and Cumulative Effects

3.2.6.1.1 Alternative A

Alternative A would have no effect to historic properties. Historic properties would continue to degrade naturally. There would be no change in effects from the current condition.

3.2.6.1.2 Alternatives B, C, and D

Under Alternatives B, C, and D five cultural resource sites are located within proposed project activity areas. Of these five sites, three sites have been determined to be eligible for the National Register of Historic Places (NRHP) while two sites are unevaluated. For the three sites eligible for the NRHP and two unevaluated sites, mitigation measures would be developed in consultation with the Idaho State Historic Preservation Officer (SHPO) in order to achieve a no adverse effect determination prior to project implementation (see Table 3-4).

Cultural resource surveys have been completed for the project area and would be submitted to the Idaho State Historic Preservation Office (SHPO) for concurrence prior to project implementation per 36 CFR 800.4 (b) (2).

Table 3-4. Site-specific Design Criteria for Cultural Resources

Cultural Resource Site Number/Type*	Unit Number	Alternative B, C and D Action	Design Criteria
10IH487/Lithic Scatter	309	Commercial Thin	Avoid
10IH883/Trail	230 354	Commercial Thin Commercial Thin	50-foot Buffer 50-foot Butter
10IH1746/Lithic Scatter	309	Commercial Thin	Avoid
10IH2164/Lithic Scatter	307	Commercial Thin	Avoid
10IH3197/Trail	301 306 307 316 318 319 373 NA	Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin Commercial Thin Road Decommissioning	50-foot Buffer 50-foot Buffer 50-foot Buffer 50-foot Buffer 50-foot Buffer 50-foot Buffer 50-foot Buffer 50-foot Buffer

Note: Site locations are protected by law (36 CFR 296.18), but will be communicated to project personnel to insure protection.

3.2.6.2 Design Criteria

The following project mitigation and design criteria (also see Table 3-5) have been identified and would be implemented to avoid impacts to all NRHP eligible sites.

Because all project activities would be conducted consistent with the National Historic Preservation Act, the Nez Perce National Forest Plan and the MOA regarding the Clear Creek Integrated Restoration Project, the implementation of these activities would result in “no adverse affect”. Thus, there is little potential for project activities to produce or contribute to negative effects that would be cumulative with other actions.

Table 3-5. Design Criteria for National Register of Historic Places Eligible Sites

Project Design Criteria	Implementation Method	Effectiveness	Applicable Alternative(s)
Avoid or protect known historic properties or sites. (Nez Perce NF Forest Plan, page II-17, Cultural Resources Standard #4).	Contract and contract administration/ inspection.	High	Alternative B, C, D
Halt ground-disturbing activities if cultural resources are discovered until an Archaeologist can properly evaluate and document the resources in compliance with 36 CFR 800.	Contract and contract administration/ inspection.	Moderate, recognition of resources and contact with Heritage personnel	Alternative B, C, D

3.2.7 Forest Plan Consistency

The alternatives comply with the Nez Perce National Forest Land and Resource Management Plans relevant to Cultural Resources. The 1987 Forest Plan with the amendments, documents goals, standards, and management directions for Cultural Resources within the forest boundary.

The following forest-wide management direction or standards, from those listed on page II-17 of the Nez Perce National Forest Plan, apply or do not apply to this project and will be met as follows (Table 3-6 and Table 3-7).

Table 3-6. Nez Perce National Forest Plan, Management Direction, or Standards That Apply to this Project

Standard Number	Subject Summary	Compliance Achieved By…
1	Survey areas of potential land disturbance…	An appropriate cultural resource survey has been conducted for the project area and would be submitted to the Idaho State Historic Preservation Office (SHPO) for concurrence prior to project implementation.
2	Evaluate and protect sites and districts…	Reference design criteria. Five historic properties are known to exist within the Area of Potential Effects (APE) associated with this project. Mitigation measures would be developed in consultation with SHPO.
3	Protect Native American religious and cultural sites	There are no Native American religious sites located within the project area. There are five Native American cultural sites located within the APE. Mitigation measures for these five sites would be developed in consultation with SHPO.
4	Protect and preserve National Register eligible historic properties	Reference design criteria. Three sites eligible for the National Register of Historic Places have been identified in the APE associated with the project. Mitigation measures would be developed in consultation with SHPO.
5 (as amended, 1990)	Consultation with the Nez Perce Tribe to protect cultural sites	Consultation with the Nez Perce Tribe has taken place.

Source: USDA Forest Service 1987a, p. II-17

Table 3-7. Nez Perce National Forest Plan, Management Direction, or Standards that Do Not Apply to this Project

Standard Number	Subject Summary	Explanation
6	Write a cultural resource overview…	This is an overall Heritage Program objective and not a project specific mandate.
7	Identify maintenance and/or stabilization needs of historic properties…	No cultural resource sites requiring specific maintenance and/or stabilization activities were identified within the area of potential effect associated with the current project area.

Source: USDA Forest Service 1987a, p. II-17

3.3 Economics

3.3.1 Analysis Area

The project area is located within Idaho County, Idaho. The economic analysis area includes local towns and communities influenced by the timber sale activities. These towns include Grangeville, Elk City, Kamiah, Kooskia, Harpster, Stites, Clearwater, Orofino, Pierce, Weippe, and Lewiston. The timber sale influence on these towns depends on their proximity to the watershed, their economic dependence on it, and their historic use of the watershed dating to settlement more than 100 years ago. The Nez Perce National Forest has provided wood to local mills since the 1930s. The Forest's output, along with BLM timber outputs, accounted for half the total timber harvested in Idaho County in the mid-1990s. Most of the Forest timber output was processed in mills located in or near the towns mentioned previously.

3.3.2 Regulatory Framework

The project complies with Forest Plan direction to develop cost-effective projects, and it complies with the NFMA by emphasizing resource management over timber volume output.

The Clear Creek project is being considered at least partially as a Land Stewardship Project under Section 347 of the Omnibus Consolidated Appropriations Act of FY 1999. This Act allows flexibility in combining traditional service and timber sale contract activities to more effectively accomplish ecosystem restoration through forest management. It also allows more flexibility in funding projects by using the timber stumpage value generated from selling the trees to pay for doing the other resource actitivies. One drawback to stewardship contracting is that those projects would not contribute any revenue to the Treasury or to the 25% Fund for counties with acreage within the Forest. All the proposed activities other than the actual timber harvesting, such as precommercial thinning, road decommissioning, and grass restoration, would be considered for inclusion as stewardship projects.

3.3.2.1 National Forest Management Act

The NFMA requires that a sale "consider the economic stability of communities whose economies are dependent on such national forest materials, or achieve such other objectives as the Secretary deems necessary" (NFMA, Sec. 14e1c). The NFMA also requires that "the harvesting system to be used is not selected primarily because it will give the greatest dollar return or the greatest unit output of timber" (NFMA, Sec. 6, g,3,E,IV). The project meets the requirements of the NFMA by using the IMPLAN model to evaluate how each alternative would affect economic stability in local communities. The project also uses harvest systems that are based on ground-truthed silvicultural practices, not on the highest dollar return, to achieve the desired long-term forest and access needs.

3.3.2.2 Forest Service Manual

The FSM directs that economic feasibility be considered in project design during the early planning and NEPA documentation. A sale feasibility analysis was done at Gate 1, which led to consideration of treatments providing cost-reducing economic benefits. One major adjustment was the use of mechanical site preparation versus burning site preparation methods where possible. The mechanical methods provide better leave tree survival and utilize cheaper purchaser-supplied equipment.

3.3.2.3 Forest Plan

The Forest Plan requires that the project provide a sustained yield of resource outputs at a level that will help support the economic structure of local communities and provide for regional and national needs (USDA Forest Service 1987a, Goal A.1, p. II-1). Alternative A would not contribute toward the Forest Timber sale program or support the economic timber harvesting structure of the local communities, while Alternatives B, C, and D would. Alternative C would best meet this goal.

3.3.2.4 Executive Order 12898; Environmental Justice

EO 12898 requires that each federal agency make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects of its programs, policies, and activities on minority populations and low-income populations in the United States and its territories.

The Clear Creek analysis did not reveal any disproportionately high and adverse impacts to Nez Perce Tribal members, minority populations, or low-income populations. None of the action alternatives are expected to negatively affect Tribal members, minority or low-income populations or any United States citizen. No environmental health hazards or adverse impacts to the fishery or wildlife population are expected to result from implementation of any alternative. This project would not disproportionately affect income level in the economic analysis area.

3.3.3 Resource Indicators

3.3.3.1 Timber Harvest–related Jobs and Income

Jobs and income generated from the project contribute to community stability.

3.3.3.2 Sale Feasibility

Sale feasibility is represented by the Present Net Value (PNV). A project with a positive PNV would be a sellable project. A project with a negative PNV would either not sell or require supplemental funding to make it sellable. The PNV is also an indicator of the amount of timber generated funding that would be available for stewardship projects or returned to the Treasury Analysis Methodology

The Nez Perce National Forest Plan Final Environmental Impact Statement (FEIS) (USDA Forest Service 1987b) describes the economic impacts of implementing the Forest Plan. The Forest Plan addresses the economic analysis process and values placed on nonconsumptive items such as recreation opportunities, community stability, cultural resources, habitats, and populations. This economic analysis will not revisit the information presented in the Forest Plan and will focus only on those costs and revenues associated with implementing the proposed activities in the project area.

The Forest Service Micro IMPLAN model was used to derive the indirect and induced economic effects. Direct economic effects were derived from mill surveys conducted by the Bureau of Business and Economic Research at the University of Montana. The following response coefficients found in the table were developed for the 1997 Clearwater National Forest Timber Sale Program Information Reporting System (TSPIRS). TSPIRS, a reporting system developed jointly with the General Accounting Office (GAO) and the Forest Service, has been reviewed and approved by Congress.

The coefficients from the Forest Service Micro IMPLAN model to derive the indirect and induced economic effects are as follows:

- Harvest-Related Jobs Generated: 13.5 per 100,000 cubic feet (MCCF)
- Harvest Income to Communities: $383,406 per MCCF
- Federal Income Tax Generated: $57,511 per MCCF

The Region 1 Gate 1 and 2 spreadsheets and the Quicksilver model with Nez Perce–Clearwater National Forests area factors were used to determine sale feasibility and appraised value. The Quicksilver model uses recent transactional evidence based on local timber sales to determine sale value. The timber stand database and extensive field reviews were used to determine timber volume and species composition; these are the two primary factors determining gross value of a timber sale. Net value depends on costs for logging system, haul distance, slash disposal, planting, and mitigation activities. The cost estimates for this sale are based on recent similar sales in the vicinity.

3.3.4 Affected Environment

In a report for the Interior Columbia River Basin Ecosystem Management Project (Columbia Basin Assessment), titled “Rural Communities in the Inland Northwest,” communities are characterized in terms of their ability to manage change and adapt to it in positive, constructive ways. The report emphasizes community resiliency, which is a function of community conditions such as economic structure, infrastructure, civic leadership, cohesiveness, and amenities.

The Columbia Basin Assessment resiliency ratings for Lewis County (Kamiah), Idaho County (Kooskia and Grangeville) and Clearwater County (Orofino, Pierce, and Weippe) are low. However, preliminary findings from a study recently completed by University of Idaho sociologists working on the Columbia River Basin Assessment show that many timber-dependent communities tend to be more resilient and able to tolerate change than is commonly assumed. The resiliency rating for Nez Perce County (Lewiston) is high. The towns of Kamiah, Grangeville, Orofino, Weippe, Pierce, and Lewiston all show high to very high historic employment in the wood products manufacturing industry per the Columbia Basin Assessment.

As of July 2013, Lewis County had an unemployment rate of 6.4%, Idaho County had a rate of 9.3%, and the rate in Clearwater County was 12.7% (4th highest in Idaho). The average unemployment rate in Idaho is 6.6%, and the national average is 7.4%. In addition, counties dependent on federal timber receipts to help fund schools and highways find that this source of funding is drying up, so they have relied more heavily on taxes to bolster their income, to the detriment of low-income families and the unemployed who feel that timber harvest should contribute more.

Idaho has always been a natural resource–based state, although as natural resource extraction declines, the state has moved toward diversification. Many communities have made impressive strides in achieving Idaho Gem Community status and working to diversify their economies. (The Gem Community program was established by the Idaho Department of Commerce to encourage communities to plan their futures.) As reported by the Idaho Department of Labor, the timber products industry went through hard times in the early 1980s, but the firms that survived were streamlined and modernized with the hope to have a consistent supply of timber from National Forest System lands.

3.3.5 Environmental Consequences

3.3.5.1 Direct and Indirect Effects

3.3.5.1.1 *Alternatives A, B, C, and D*

Table 3-8 displays the job and income consequences of implementing the timber harvest alternatives. The Forest Service Micro IMPLAN model was used to derive the indirect and induced economic effects of the timber harvesting; the model does not reflect additional jobs and income related to implementation of the non-timber harvest stewardship activities, such as precommercial thinning and road decommissioning, which are the same for all the action alternatives. These stewardship activities would generate some additional jobs, but not to a level like the timber harvest and would not point to any alternative as generating more than the other because they would be the same between alternatives, except for the no action alternative.

Alternative A (No Action) would not generate any timber harvest jobs. Alternative C would generate the most jobs and revenue, because it generates the most timber volume, followed by Alternatives B and D.

The other activities being proposed along with timber management, such as road decommissioning, precommercial thinning, broadcast burning, and reforestation, also provide jobs and income to the local economy. For example, in addition to providing jobs for heavy equipment operators required to decommission the roads, the project will create jobs for laborers performing erosion control and project inspection.

Table 3-8. Timber Harvest Jobs and Income

Alternative	Volume (CCF)	Jobs Sustained	Community Harvest Income	Federal Income Tax
A	0	0	0	0
B	141,500	1,910	$54,252,000	$8,138,000
C	158,000	2,133	$60,578,000	$9,087,000
D	116,400	1,571	$44,628,000	$6,694,000

Predicted Stumpage and Present Net Value

Each alternative produces different benefits and costs associated with the timber harvest, roadwork, fuel treatment, reforestation, mitigation measures (skid trail decompaction), and other related timber harvest activities. This part of the economic analysis compares the differences in benefits and costs by examining the timber's appraised value and PNV for each alternative. The appraised value is the timber value based on recent bidding; that is, the amount the Nez Perce National Forest anticipates the timber would sell for minus costs for logging, road reconstruction, site preparation/fuel abatement, and mitigation. The PNV is the anticipated selling value minus the costs to implement the sale and reforest the land. An alternative with a positive PNV has stumpage values exceeding costs, whereas an alternative with a negative PNV has costs in excess of stumpage values and may require supplemental funding to complete all activities. The PNV money is an indicator of funding that could be available to fund stewardship projects on sales designated for stewardship contracting.

Information provided by the economic models is used as a tool to understand the relative monetary differences between alternatives rather than to predict exact values for each alternative, since the variables may change between now and the time the timber sells.

Alternative A (No Action) does not generate any value or accrue any costs associated with the NEPA decision, so its PNV is zero. However, Alternative A would not be able to offset the $175,000 cost of doing the NEPA analysis. Tree mortality is occurring in many of the areas planned for regeneration. If a large wildfire (100+ acres) were to start as a result of fuel buildup from the anticipated tree mortality, fire suppression costs would likely exceed $300,000 (for comparison, the 350-acre Granite Fire of 2011 cost $2.2 million).

Alternatives B, C, and D are all predicted to generate enough stumpage value to cover all of the sale costs, plus reforestation, while also capturing the timber value before it deteriorates from tree mortality. All of these alternatives should generate revenue, with Alternative B being the most economically feasible and generating the highest revenue (Table 3-9).

An item that contributes to these Alternatives' efficiency is that the harvest units are large in size and focused in a localized area, which reduces mobilization costs. In addition, completing the vegetation treatments in larger areas, such as in Alternative C which regenerates larger patches, allows for areas to be completed, and is then closed for an extended period of time while the new trees grow. This reduces road maintenance costs and the continued costs of multiple entries.

All the action alternatives would use a combination of Forest Service burning and/or machine piling for the reforestation site preparation. Site preparation and tree planting are the two largest single-cost activities associated with implementing the different alternatives, but since each action alternative has the same costs per acre, the economic effect is proportional to the amount of acres needing site preparation and planting. To reduce reforestation costs, natural regeneration should be implemented where possible and where it meets the project purpose and need. Table 3-9 displays the predicted appraised total and PNV for each alternative. As noted in the Table 3-9, Alternative C produces the most volume, but Alternative B provides the greatest revenue, because Alternative B requires less site preparation and involves lower planting costs than Alternative C. Alternative B has higher site preparation and planting costs than Alternative D, but Alternative B generates enough commercial thin volume, which doesn't require reforestation costs, to offset the other costs (Alternative B thus produces a higher overall economic return).

The economic impact of using fewer roads in Alternative D equates to an 18% to 28% reduction in volume outputs, an 11% to 13% reduction in acres treated, and a $1.5 million to $2.4 million reduction in revenue generated. Alternative D would utilize longer skidding distances to bring logs to a landing, which can result in undesirable soil impacts due to logs dragging on the ground for a longer distance verse being carried on a truck.

Table 3-9. Predicted Stumpage and Present Net Value

Alt.	Volume		Appraised Total[a]	Reforestation[b]	Implementation[c]	Present Net Value	Stewardship Costs[d]
	CCF	MBF					
A	0	0	$0	$0	$0	$0	$0
B	141,500	75,300	$7,941,000	$1,784,000	$409,000	$5,748,000	$1,258,000
C	158,000	85,200	$8,560,000	$2,842,000	$454,000	$5,264,000	$1,258,000
D	116,400	61,800	$5,760,000	$1,489,000	$385,000	$3,886,000	$1,258,000

[a] Appraised value bid includes slash treatment, skid trail decommissioning, and road costs associated with the harvest.

[b] Reforestation costs include planting costs (trees, labor, and pre/post-treatment exams with overhead).

[c] Implementation costs include presale, engineering, and administration costs. NEPA costs, which total about $277,000, are not included in this cost total.

[d] Stewardship costs include precommercial thinning, road decommissioning, grass restoration, and landscape prescribed burning.

3.3.5.2 Cumulative Effects

The cumulative effects area includes Clearwater, Idaho, Lewis, and Nez Perce counties in Idaho. The timber volume is scheduled to be sold through 5 different sales over a 5-year period, starting in 2015. Typical sale duration would be 4 years each; the last sale would be completed in 2025 (harvest activities usually do not start on the first year a sale is sold), for a total of about 10 years of harvest activities. Post-harvest reforestation and site preparation work could continue for up to 5 years following harvest on the last sale, creating a potential end date of 2030, for a total of 15 years of harvest plus post-harvest activities.

Economic impacts for activities such as logging and sawmilling lumber are shown in the section above. These impacts are described as direct and indirect effects, but they are also considered cumulative effects due to the additional jobs, taxes, and income they provide. When impacts from additional jobs and income are taken into account, this project contributes to the Forest's 5-year timber sale plan and may boost the Forest's output by 10 million board feet per year. Current sold sales and foreseeable local sales, as shown on the Forest's Five Year Action Plan, would also affect the same communities and contribute to the long-term timber flow to these communities.

3.3.5.2.1 Alternative A—No Action

Since this alternative does not propose any timber harvest or other stewardship activities, it would not contribute cumulatively to local community jobs and income. Alternative A would maintain current unmanaged use and related income. It could potentially increase future firefighting costs and locally generated income as trees die and create excessive fuel loadings susceptible to wildfire ignitions.

3.3.5.2.2 Alternatives B, C, and D

Added to the Forest's 5-year timber sale plan, these alternatives would sustain jobs (ranging from 1,571 to 2,133 jobs). However, Alternatives B, C, and D are not expected to generate a large number of jobs or significant amounts of income from timber harvest or roadwork; therefore, these alternatives would not be likely to cumulatively affect local communities beyond the past 3-year employment averages. The mills tend to adjust their annual production to sustain long-term outputs (instead of boom-and-bust cycles) by purchasing private and State timber along with National Forest sales.

Prescribed burning is planned in association with the previously mentioned timber sale projects. Prescribed burning is mostly handled internally by the Forest Service. Forest Service employees are supported by local community services. The prescribed burning proposed under other projects in the area can be handled with the normal Forest Service workforce and therefore would not have a cumulative effect on the local communities.

Additional stewardship items including road decommissioning, precommercial thinning, and grass restoration would also contribute money to the local communities.

If additional forestry activities are implemented within the counties by the State or by private industry, additional forestry workers may be needed.

3.4 FUELS

3.4.1 Analysis Area

The fuels analysis area encompasses the upper two-thirds of the Clear Creek drainage and all of its tributaries. This area was selected because it includes all Forest NFS managed lands that could be affected by project activities.

3.4.2 Regulatory Framework

Nez Perce National Forest Plan (Forest Plan) direction and all federal and State laws and regulations applicable to fuels would be applied to the project.

Nez Perce National Forest Plan—The project meets the Nez Perce National Forest Plan's specific fire management goal for this area, which is to "protect resource values through cost effective fire and fuels treatment through the utilization of material and using prescribed fire" (USDA Forest Service 1987a, p. II-2).

The modified fuel bed would decrease the probability of stand-replacing crown fire and increase firefighter effectiveness, reducing the probability of resource damage at a lower cost while utilizing wood fiber.

Smoke Management—The Forest Service is a member of the Idaho/Montana Airshed Group. This airshed group is composed of State, federal, tribal, and private organizations that are dedicated to the preservation of air quality in Idaho and Montana. Its members are prescribed burners and the public health and regulatory agencies that regulate the burning cooperatively to prevent smoke impacts from fires designed to accomplish land management objectives. The analysis area falls within Airshed 12B.

Project-related prescribed fire activities would be approved by the airshed group; approval would be contingent on prevailing weather conditions, other planned ignitions in the airshed, and the resultant smoke impacts, including impacts to the Selway–Bitterroot Wilderness (a Class 1 airshed).

3.4.3 Resource Indicators

Issue: From a fuels perspective, the vegetation includes little variation. Variations can create barriers that can slow a fire or alter its behavior (such as dropping the fire from the crowns to the ground). Existing areas of past harvest and other vegetation types such as shrubfields could act as barriers; however, they are too small to affect fire behavior at the landscape scale. The current homogeneous fuels support a risk of crown fire that could pose a threat to life, property, and other resource values. Approximately 94% of the project area is in the WUI as defined by the Idaho County Wildfire Mitigation Plan Committee (Idaho County 2009).

Indicator: Percentage of project area that could support a crown fire (active, passive, or conditional).

Issue: Existing landscape health is not consistent with a landscape that operates with a natural disturbance cycle. In this case, fire was the dominant disturbance agent. Mean fire return intervals in some of the landscape are above historical conditions. Age classes are trending toward larger size classes and lacking in early seral size classes. In a healthy landscape, disturbance would create larger patch sizes in a mosaic. In the analysis area, timber harvest has created a smaller, more uniform, linear-edged series of patches; fire exclusion has eliminated any new sizable disturbance-created patches since the early 20th century.

Indicator: Fire Regime Condition Class (FRCC) is a measure of landscape health based on fire return interval and age class distribution. It describes the degree of departure between the current vegetation and a simulated historical reference condition. Patch size accounts for the spatial distribution across the landscape.

3.4.4 Analysis Methodology

Field Sampled Vegetation (FSVeg) stand exam data were collected for the treatment units and other stands within the project area in 2011. This information was processed through the Forest Vegetation Simulator and Fire and Fuels Extension (FVS/FFE) model (Reinhardt and Crookston 2003). Outputs from this model include surface fuel loadings, fire behavior fuel models, canopy base height, and aerial fuel loadings that determine whether a fire is a surface fire or crown fire. Techniques to reduce crown fire occurrence and severity include the following: increase canopy base height; reduce canopy bulk density; reduce forest canopy continuity; and reduce surface fuels (Scott and Burgan 2005). With the exception of Alternative A, the proposed treatments accomplish some or all of the techniques. The FSVeg Spatial Data Analyzer v2.3.0 was used to collectively grow the stands through 10-year timesteps to visually show the changes through space and time.

Fire type (surface or crown) was modeled in FVS/FFE under 97th-percentile weather conditions, representing extreme fire weather. Weather data from June 1 through September 30 were selected to represent the entire summer fire season. Percentile weather was computed using Fire Family Plus (Main et al. 1990). Twenty years (1990–2010) of weather data from the most representative weather station were analyzed to determine weather conditions.

Two different analyses of landscape health using FRCC were conducted. One used the FRCC software and direction outlined in the Interagency FRCC Guidebook. The silviculturist developed a crosswalk between LANDFIRE Biophysical settings and VRUs; tree size class was determined by using the R1 Vmap vegetation layer. The second analysis was used only for describing the existing condition and utilized the FRCC Mapping Tool software and LANDFIRE vegetation layers. The patch size analysis (FRAGSTATS, see Silviculture report in the project record) indicates whether the area will trend toward desired conditions after treatments are completed.

3.4.5 Affected Environment

3.4.5.1 Fire Occurrence, History and Risks

Historically, fire was the primary disturbance factor that shaped the composition and structure of forests in the Clear Creek drainage. The largest wildfires burned 27,245 acres between 1870 and the 1931 fire, which burned approximately 11,000 acres. Only 155 acres have burned since then. Overlaps in fires occurred mostly on the

South Fork Clear Creek area between the late 1800s and 1931, with other minor overlaps occurring later. The overlap in all fires totals about 7,900 acres. The total area burned was therefore approximately 19,490 acres, or 45% of the drainage. Fires burned mostly on dry-to-moist habitat types of the South Fork, mainstem, and Middle Fork of Clear Creek. Stand-replacement fire occurred in the South Fork, while mixed-severity fires occurred in the upper Clear Creek and Solo Creek areas. The determination of severity was based on the overall age class distribution of trees in the area.

No large fires have been documented in the moist habitat types in the headwaters of the drainage within the last 150 years. As the forests in these habitat types begin to age, they become more susceptible to mortality from insects and disease, which increases the risk of crown fire. This weakness was observed in the upper South Fork Clear Creek area in the summer of 2011, when an infestation of the Douglas-fir tussock moth (a defoliator) began occurring. Damage to trees was noticeable over about 3,000 acres. A second outbreak in 2013 would have led to heavy tree mortality; however no outbreak occurred. A review in 2013 showed that the tops were killed in many of the older trees but the younger trees showed no signs of damage.

Since tracking began in the 1970s, a total of 285 fire starts have occurred in Clear Creek. The number of starts per decade ranges from 53 to 90. The total acreage burned ranges from 19 to 80 acres per decade since 1932.

Effective wildfire suppression since the early 1900s has greatly reduced fire frequency in the area. Fires that occur in the area are suppressed due to the proximity to private property adjacent to the forest boundary and the timber management areas. Current fuel profiles would allow crown fires to establish in over 50% of the area. Once established, these fires are virtually impossible to stop without the fire running into a barrier (such as a change in fuel type) or the weather variables changing (such as relative humidity rising overnight). Indirect suppression strategies would need to be employed for a crown fire. Conditions like these can lead to large amounts of burned acreage, high costs, and adverse impacts to resources including soils, wildlife, water resources, and infrastructure.

Approximately 94% of the project area lies within the rural Salmon-Clearwater WUI. The WUI designation was determined by Idaho County and a group of collaborators in 2005 and revised in 2009 as mandated by the National Fire Plan of 2001 (USDI and USDA 2001). This mandate allowed each County to determine its own definition of WUI. Idaho County adopted this philosophy: “The wildland-urban interface refers to areas where wildland vegetation meets urban developments. These areas encompass not only the interface (areas immediately adjacent to urban development), but also the continuous slopes that lead directly to a risk to urban developments.” In addition, the County identified the protection of structures and private property and protection of “the biological resources of the management area” as concerns (Idaho County 2009).

The Nez Perce National Forest Plan direction requires fire suppression (control, contain, confine) in about 70% of the drainage. Fires for resource benefit could be allowed to burn in the Clear Creek Roadless Area, the upper South Fork, and a portion of the West Fork of Clear Creek if sufficient fuel modifications are implemented.

3.4.5.2 Vegetation and Fuels

A distinct moisture gradient occurs from west to east in the project area; this gradient is reflected in the range of habitat types in the area. The western portion of the drainage contains drier habitats that begin with bunchgrasses (which do not support trees) and move into the dry ponderosa pine/Douglas-fir/ninebark habitat types. Historically, fire played an important role in maintaining these habitat types, with low-severity fires occurring every 5–50 years and severe-intensity fire occurring every 90–200 years. Patch sizes ranged from 50 to 1,500 acres. Current patch sizes created by timber harvest range from 6 to 282 acres. Moving east, the habitats quickly transition to moister types dominated by grand fir and western redcedar. Historically, these habitat types were dominated by mixed species with sizable representation of white pine and western larch. White pine and western larch are long-lived tree species typically established after major forms of disturbance (fire windthrow) and have the potential to occupy a site for 200–300 years. Patch sizes for these species ranged from 40 to 1,000 acres historically. Current patch sizes range from 1 acre to 282 acres. The last habitat types found in the drainage are the cooler habitat types located in the headwaters of Clear Creek. These are dominated by subalpine fir and lodgepole pine and typically have stand-replacing disturbances every 90–150 years. Historically, patch sizes ranged from 40 to 1,000 acres. Current patch sizes range from 1 acre to 282 acres.

Barriers to large fire spread are limited in the project area. A compilation of studies has shown that recent regeneration units or fresh fire scars are effective at stopping crown fires or reducing their effects if they are over 400 feet wide (Hudack et al. 2011).

3.4.5.3 Fire Regime and Condition Class

A natural fire regime is a general classification of the role fire would play across a landscape in the absence of modern human mechanical intervention, but includes aboriginal burning (Agee 1993). Coarse-scale definitions for natural (historical) fire regimes were developed by Hardy et al. (2001) and Schmidt et al. (2002) and interpreted for fire and fuels management by Hann and Bunnell (2001). The 5 natural fire regime classifications are based on the average number of years between fires (fire frequency) and the severity (amount of replacement) of the fire on the dominant overstory vegetation. Historically, the drier mixed-conifer sites best fit a Fire Regime I, while the wetter sites best fit a Fire Regime III. However, with the unnatural effects of fire suppression, the drier sites are trending toward a Fire Regime II due to increases in ladder fuels; these conditions would increase fire severity. The same is occurring in the wetter sites, which are trending toward Fire Regime IV.

Fire behavior effects and other associated disturbances for the low-departure class (FRCC 1) are similar to those that occurred prior to fire exclusion and other vegetative management activities. Ecosystems with a moderate departure from historic rates (33%–66%) have an increased risk of the loss of species composition, structural stage, and canopy closure from noncharacteristic fire. Class 3 ecosystems with a high departure from historic rates (>66%) feature vegetative composition and fuel characteristics that are highly altered from the natural regime; in these ecosystems, the risk of loss of key components is high.

The FRCC in the project area, based on the vegetation attributes, is moderate (FRCC 2), with ranges from 41% in the West Fork drainage, 47% in the upper Clear Creek drainage, and 53% in the South Fork drainage. The overall FRCC, using the LANDFIRE/Vegetation Response Units (VRU) crosswalk and incorporating the fire frequency, yields a score of 39%, or a rating of moderate. A moderate rating means that the fire cycle is trending away from its natural ranges and is being affected by fire suppression or other land management activities. Over time, the drainage will trend toward the high-departure class. Estimates indicate that the area will move from moderate departure to high departure within 30 years if no disturbances occur, because the majority of the area will fall outside of the fire return interval of 30–100 years.

Surface fuel loadings (downed wood) are increasing due to ongoing tree mortality and fire suppression. The benefits to soil productivity increase as more downed wood decomposes; therefore, more nutrients are available for plant growth. Ladder fuels are also increasing due to understory tree growth. Larger amounts of surface and ladder fuels increase the risk of high-severity, stand-replacing fire. This type of fire could lead to reduced soil productivity and moisture-holding capacity.

From a fuels perspective, the vegetation includes little variation. Variations in vegetation patterns create barriers that can slow a fire or alter its behavior (such as dropping the fire from the crowns to the ground). Existing areas of past harvest and other vegetation types, such as shrubfields, could act as barriers; however, they are too small to affect fire behavior at the landscape scale.

3.4.5.4 Potential Fire Behavior

Fire type (e.g., surface and crown) was modeled for the project area for extreme (97^{th} percentile) weather conditions for visual display. The percent of fire type was quantified for the actual treatment units, and all crown fire activity (active, passive, or conditional) was grouped. Currently, 51% of the project area is susceptible to crown fire.

3.4.6 Environmental Consequences

As noted above, the analysis area for direct and indirect effects of the alternatives is the project area.

3.4.6.1 Alternative A—No Action

3.4.6.1.1 *Direct and Indirect Effects*

Under this alternative, no treatments are planned; therefore, fuels would persist as discussed under the existing condition and accumulate further over time.

Alternative A would cause no direct effects to fire type or FRCC rating, because no vegetation treatment would take place under this alternative. The indirect effect would be the trending of the landscape toward a FRCC 3 rating within 30 years. There would continue to be a lack of stands of young trees as existing stands continue on with succession. The landscape would also continue to trend toward to a more uniform forest dominated by non-early seral species. Canopy base height would remain low, crown bulk density would remain high, tree density would remain high, and the surface fuels would remain the same. The amount of the project area that could experience crown fire would increase as time passes. Therefore, direct control would be difficult, fires would be large, and costs would be high. Barriers to large fire spread would remain minimal.

Direct Effects

If Alternative A is selected, 51% of the proposed treatment area would continue to be susceptible to crown fire in 2022. FRCC remains in a moderate category at 39%. The patch sizes associated with these types of landscapes remain below desired conditions.

Indirect Effects

Factors favoring crown fire remain and increase over time. The project area becomes less diverse. Barriers to fire remain low, fire containment opportunities are limited, and fire size and costs are expected to increase. The landscape will trend toward a homogeneous forest dominated by large nonseral trees as the remaining smaller, younger patches continue with succession. No biomass removal opportunities or smoke emissions from logging slash will occur.

3.4.6.2 Alternatives B, C, and D

3.4.6.2.1 Direct Effects

The direct effect of these alternatives is a reduction in potential crown fire acreage, a slight improvement in FRCC, and a marked improvement in patch size. Potential crown fire area is reduced by 7% in all alternatives, moving the area from 51% to 44% by the year 2022. The regeneration treatments would influence FRCC ratings by changing seral classes from mature to young stands. However, approximately 50% of current early seral patches change seral class within 10 years, so the effect of the regeneration treatments is lessened. The project area remains at a FRCC 2 rating even after treatments, due to relatively low amounts of proposed regeneration harvest. Alternatives B, C, and D regenerate 6%, 10%, and 5% of the project area respectively. All the action alternatives use prescribed fire on up to 3% of the area. Alternatives B and D reduce the overall landscape departure rating from 39% to 38%, and Alternative C reduces it to 37%, which is a slight improvement on the landscape but still maintains the area in the moderate category.

Patch size increases across all action alternatives (Table 3-10), driven by the varying amount of regeneration harvest. Mean patch sizes are not as large as historically occurred; however, the trend is positive. Given the distribution across the landscape, these patches emulate a mixed-severity fire regime. Treatment units range in size, which is important to landscape and fuel variability. Discontinuities in surface, ladder, and crown fuels interrupt fire spread, but relatively small patches may not have a substantial effect on large fires. Treatments of individual stands under a given prescription would probably be irrelevant to fire behavior and effects at the landscape scale, because wildfires are often larger than individual treatment units (Finney and Cohen 2003). Many of the treatments in the proposed action span several stands and therefore should be large enough to affect a large fire. Canopy base heights would be raised, crown bulk density would be substantially lowered, tree density would be decreased, and surface fuels would be treated, all of which would lower fire intensity in the treatment units. Direct control options in the event of a fire would increase across the landscape as the fuel profile is interrupted, which should reduce fire size and cost.

All the action alternatives affect similar acreage, and the reduction in acreage susceptible to crown fire is the same for each alternative: 7%. Acreage susceptible to crown fire will drop from the current 51% to 44% by 2022.

Table 3-10. Percent of Analysis Area by Structural Class and Mean Patch Size by Alternative

	Alternative A (Existing)		Alternative B		Alternative C		Alternative D	
Structural Class	Percent of Analysis Area	Existing Mean Patch Size	Percent of Analysis Area	Mean Patch Size	Percent of Analysis Area	Mean Patch Size	Percent of Analysis Area	Mean Patch Size
Seral Shrub	7	179	6	252	6	252	6	252
Stand Initiation	17	48	25	96	26	104	25	91
Stem Exclusion	26	115	20	131	20	119	21	128
Understory Reinitiation	17	62	20	83	18	83	18	83
Young Multistory	3	27	2	26	2	904	2	26
Old Single-Story	17	77	16	116	17	121	16	116
Old Multi-story	13	74	11	81	11	72	11	81

Individual and total FRCC stratum departures change very little; the differences are primarily driven by the amount of regeneration harvest in each alternative, which changes size classes from mature classes to young seral classes. The overall FRCC remains a 2 across all alternatives (Table 3-11).

Table 3-11. Landscape Fire Regime Condition Class Stratum Departure, by Alternative

Stratum (Vegetation Response Units)	Stratum Comp %	Stratum Departure			
		Alternative A (No Action)	Alternative B	Alternative C	Alternative D
3	7	70	70	70	70
8	29	48	47	43	48
10	12	49	49	49	49
17 & 7	52	33	31	31	31
Landscape Departure		39	38	37	38
Landscape Fire Regime Condition Class		2	2	2	2

3.4.6.2.2 Indirect Effects

The main indirect effects from the action alternatives result from the tree residue generated from harvest. Slash treatments would either result in biomass to be hauled away or piles to be burned. Biomass is measured in dry tons; smoke production in particulate matter (PM_{10} and $PM_{2.5}$) is measured in pounds. Table 3-12 and Table 3-13 show the amounts of biomass and smoke that would be produced as a result of the action alternatives.

Table 3-12. Tons of Biomass Generated from Harvest Activities, by Alternative

Activity	Total Biomass - Tops/Limbs		
	Alternative B	Alternative C	Alternative D
Variable Retention	22,100	30,384	16,177
Commercial Thin	31,244	21,193	25,818
TOTAL	**53,344**	**51,577**	**41,995**

Table 3-13. Pounds of PM_{10} and $PM_{2.5}$ Generated From Harvest Activities, by Alternative

Activity	Alternative B		Alternative C		Alternative D	
	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$	PM_{10}	$PM_{2.5}$
Variable Retention	308,295	268,515	470,952	410,184	250,744	218,390
Commercial Thin	435,860	379,620	328,492	286,106	400,179	348,543
Prescribed Burning	2,296,916	1,991,682	3,257,048	2,706,396	2,090,560	1,737,120
TOTAL	**3,041,071**	**2,639,817**	**4,056,492**	**3,402,686**	**2,741,483**	**2,304,053**

3.4.6.2.3 Cumulative Effects

The cumulative effects geographic boundary for fuels is the project area because project activities would have localized effects on fuels and fuel continuity, which influences the FRCC. The amount and arrangement of fuels directly affects fire type. The project area is sufficient to display effects. The time frame for cumulative effects is 10 years.

The only activities considered for cumulative effects to fuels are management activities that may increase or decrease fuels over the next 10 years. The only activity considered for cumulative effects is fire suppression/exclusion. No current activities and no foreseeable future activities would affect fuels in the cumulative effects area.

Fire suppression has been effective in the project area for nearly 100 years. The incremental effect of suppressing each small fire in the watershed has promoted late seral species (rather than early seral species) and changed the forest structure, which in turn has changed the way the forest responds to fires.

Alternative A—No Action

When combined with fire suppression, this alternative would cause a cumulative effect. Fire exclusion has created the current condition of contiguous fuels. Crown fire potential would continue to increase across the project area without treatments, FRCC ratings would move to the higher end of the moderate category in 10 years, and patch size would not be changed, which could affect future fire behavior.

Alternatives B, C, and D

A minor positive cumulative effect would be associated with the action alternatives. Fuel modifications across the landscape and in key locations along the Forest boundary could allow for natural ignitions to burn freely in portions of the project area. Fire suppression would continue on lands managed for timber; however, treatments would reduce fuels, help to improve FRCC ratings, and reduce crown fire potential in these areas.

3.5 NOXIOUS WEEDS

3.5.1 Analysis Area

The analysis area for this assessment includes only the 43,731 acres of NFS lands, all of which lie within the upper two-thirds of the Clear Creek drainage.

3.5.2 Regulatory Framework

Analysis and evaluation of noxious weeds in this project is based on direction contained in the Federal Noxious Weed Law (1974) as amended (1975), Executive Order 13112 for Invasive Species. Forest Service Policy (FSM 2080.5), Nez Perce National Forest Plan (USDA Forest Service 1987a, II-7, II-20, II-26, III-6), and Idaho State Noxious Weed Code (Title 22, Chapter 24).

In general, the Forest is directed to implement an effective weed management program with the objectives of preventing the introduction and establishment of noxious weeds;

containing and suppressing existing weed infestations; and cooperating with local, state, and other Federal Agencies in the management of noxious weeds.

3.5.3 Analysis Methodology

This assessment addresses the presence of noxious weeds relative to expansion risk, susceptible habitats, and spread vectors. The effects are considered within the Clear Creek Integrated Restoration Project.

3.5.3.1 Susceptible Habitats

Habitats were classified as having low, moderate, or high susceptibility based on habitat type group (HTG) characteristics and known ability of weeds to colonize in these habitat types. Highly susceptible habitats can be colonized and dominated with exotic plants even in the absence of intense and frequent disturbances. HTGs with a low rating are only slightly susceptible to weed colonization.

3.5.3.2 Weed Expansion Risk

The risk of weed expansion was determined by assessing the following factors; susceptibility of HTGs, the presence of weed infestations (seed source), the amount of fire and harvest activity (site disturbance), and the density of roads (spread vectors). Weed risk is the indicator of weed expansion in the project area. Geographic Information Systems (GIS) data were used to display and calculate acres of activities occurring in each weed expansion risk zone.

While it is well known that risk of weed invasion increases with disturbance and is variable depending on specific habitats, management activities and variable seasonal climate, making exact determinations of weed response would be extremely difficult if not impossible. In any scenario, the best predictions of weed response would be based upon local parameters of the particular project area. The weed risk model used by the Nez Perce National Forest is based upon local habitats, weed occurrences, disturbance levels, and available vectors. The logic and framework that this model has been based upon has been widely respected and adapted for a broader regional-level prediction model sanctioned by the Region One office of the U.S. Forest Service.

3.5.3.3 Exotic Plant Inventory Data

Knowledge of existing vegetation populations is limited in the project area. Some surveys have been conducted, but generally these have been of limited scope. Where noxious weed populations have been documented and/or treatments have occurred the data is accurate and reliable.

3.5.4 Affected Environment

Idaho’s noxious weeds are plant species that have been designated “noxious” by law in the Idaho code (Title 22, Chapter 24, “Noxious Weeds”). There are currently 64 Noxious Weeds on the state List. These 64 weeds are separated into three Categories based on the level of concern, which affects how they are managed. **Statewide Early Detection Rapid Response (EDRR)** category is top priority, as these are the new invaders and pose the greatest risk. No weeds in this category are in the project area. The next level is **Statewide Control**, these plants can be eradicated, but in most cases they are managed to reduce the infestations within 5 years. No weeds in this category are known to exist in the project area. The last category is **Statewide Containment**, most plants in this category are established populations and managed locally depending on the size and density of the infestation. Current noxious weed inventories in the analysis area identify 2 species from the Statewide Containment Category, Spotted knapweed (*Centaurea stoebe*) and Canada thistle, (*Cirsium arvense*) as the most widespread. These two weed species can be found primarily along roads and in the open, drier habitats within the project area. Two other weed species on the Statewide Containment Category, Houndstongue (*Cynoglossum officinale*) and Oxeye Daisy (*Leuxanthemum vulgare*), also exist in small numbers within the analysis area, but are not inventoried. These last 2 species are sporadically dispersed throughout the district, mostly by animals, and rarely occupy continuous areas, which makes mapping almost impossible.

Currently the Moose Creek Ranger District conducts integrated weed management strategies that deal with weed infestations within the project area based on priorities outlined in the Annual Operating Plan for the Clearwater Basin Weed Management Area, a community based cooperative (CBWMA). The area has and will continue to receive high priority for invasive weed control work prior to and throughout the life of the proposed project. Noxious weed treatments are currently conducted with crews from the Forest Service, County, Private Contractors, and Idaho Backcountry Horseman. Monitoring and inventory of these weed populations would occur in conjunction with these treatments.

Weed expansion in the analysis area is greatly influenced by habitat susceptibility, seed availability, seed or propagule dispersal, and habitat disturbance. The probability that weeds will expand in the project area depends on the interaction of these four factors. Weed expansion begins with the dispersal of seed from existing weed infestations adjacent to uninfested areas. Roads and trails are the primary means by which people and animals interact with the environment and therefore are an important spread vector. These linear corridors act as dispersal networks for exotic plants. The majority of documented infestations within the analysis area are along the transportation corridors.

Disturbance creates spatial and temporal openings where sites become suitable for plant establishment, and where usable light, space, water, and nutrients are available to meet the specific growing requirements of the plant. Disturbance may increase the susceptibility of an otherwise intact plant community to weed invasion by increasing the availability of a limited resource. Natural or human caused fires along with timber harvest and grazing are broad scale disturbances that influence the amount of available habitat for weed establishment.

Weed expansion risk in the analysis area was determined by assessing the susceptibility of habitat type groups, the presence of weed infestations (seed source), the amount of recently burned or harvested areas (site disturbance), and the density of roads or trails (spread vectors). The southern portion of the analysis area in VRU 3 (Breaklands) is characterized by Douglas-fir and dry grand fir habitat types. These habitat types are highly susceptible to weed colonization. Cooler grand-fir and mixed conifer habitats which occur over the rest of the Breaklands and all of the Uplands tend to be moderate to low with regard to weed expansion risk. Areas at risk to expanding weed populations were calculated using GIS data and the following results were given for the Clear Creek Analysis Area.

Expansion Risk Probability:

High—2,878 acres/7%
Moderate—35,784 acres/81%
Low to closed—5,160 acres/12%

Approximately 12% of the project area habitat can be characterized as having a low or closed susceptibility to invasive plants. Moderately susceptibly habitats encompass about 81% of the project area, while highly susceptible habitats make up only 7%. Overall, the project areas can be characterized as having a mostly moderate to low susceptibility to invasive plants, with moderate areas making up the large majority.

3.5.5 Environmental Consequences

3.5.5.1 Direct and Indirect Effects

3.5.5.1.1 Alternative A

Under this alternative, management practices and use of the project area will continue under current management, with no further actions proposed. The risk of noxious weed expansion will continue at current levels.

3.5.5.1.2 Alternatives B, C, D

All of the action alternatives have the potential to spread weeds to some degree because of ground disturbing activities associated with Timber Harvest, Temporary Road Construction, and Prescribed Burning. The risk of noxious weed introduction is greater when the proposed project activities are within close proximity to existing infestations and a seed source. The level of expansion depends directly on how well design criteria are followed. Pioneering weeds such as thistles can be initially expected to occur in any burned areas with bare soil. Accurate data on exactly how fast each weed species would spread in response to ground disturbing actions is not available as weed models do not distinguish between differing categories of disturbance. It is estimated, however, that 1% to 10% of the activity acres would experience weed establishment following treatments. With rigorous application of design criteria and monitoring, the expansion would be closer to 1%. With poorly implemented design criteria, expansion would be closer to 10%.

Of the action alternatives, Alternative C would result in the most disturbed acres (11,965) and the greatest potential for weed expansion. Alternative D at 10,788 acres would have the least potential to spread weeds, and Alternative B would be somewhere in between at 11,804 acres. The difference between the 3 action alternatives is minor when it comes to total acres of disturbance, therefore the relative risk of weed expansion in the proposed project area would be somewhat similar for all three. This is a relative ranking of alternatives based on total acres of disturbance. It is recognized that the actual treatment acres or actual amount of ground disturbing activity would likely be less than the gross acres displayed.

Levels of herbicide application would be expected to increase initially under all action alternatives as existing weed populations are treated and design criteria for other activities are developed and implemented. Alternative C would carry the highest levels of potential herbicide application. Assuming weed management actions are effective, herbicide application levels would taper off over time. Complete eradication of all weeds would not be attainable under any alternative. Weeds such as spotted knapweed and Canada thistle would be contained and managed locally.

3.5.5.2 Cumulative Effects

The no action alternative would continue some ground disturbing activities common to all Alternatives. Weeds would continue to invade and spread across the landscape. The cumulative effect of these activities combined with ongoing human and natural disturbances create the existing rate of weed spread. Additionally, the level of weed colonization currently observed would be expected under the No Action Alternative A.

Activities proposed under the Action Alternatives B, C, and D, when combined with ongoing disturbances associated with livestock grazing, recreation use, and road maintenance have the potential to increase the rate of noxious weed spread more so than the No Action Alternative A.

Past and present disturbances associated with vegetation treatments added to reasonably foreseeable actions would create a cumulative effect on weed expansion by the combination of distribution of weed seed, ground disturbance, and creation of spread vectors. The degree of the cumulative effect would vary depending upon the number of entrances over time, distribution of disturbance across the analysis area and acres disturbed. The impacts of cumulative effects incurred by the Action Alternatives B, C, and D to the risk of weed expansion would be eased with the implementation of the design criteria.

With increased disturbance within and outside of the analysis area, opportunities for the spread of new invaders increase. As vehicles, equipment, animals, and humans move through the landscape, each has the potential to carry weed seed to new and currently uninfested areas. This spread really has no limit other than the susceptibility of receiving habitats. Though proposed activities from this project will increase overall weed risk for a short time, habitat readily available for weed invasion in the long term should decline due to overall trends in habitat management, increase in landscape restoration, advancement of succession and progressive weed management.

Effects from past actions are represented within the existing condition. Reasonably foreseeable activities include:

- Proposed Clear Ridge Nonsystem Road Decommissioning and Reconstruction (2014 & beyond)
- Proposed Browns Spring Culvert Replacements and Road Decommissioning & Reconstruction (2013/2014)
- Proposed Eastside Grazing Allotment (2014/2015)

3.6 RARE PLANTS

3.6.1 Analysis Area

The analysis area for this assessment includes only the 43,731 acres of NFS lands, all of which lie within the upper two-thirds of the Clear Creek drainage.

3.6.2 Regulatory Framework

Forest Plan direction and all Federal and State laws and regulations pertaining to the management of rare plants on the Forest would be applied to the project, including the NFMA of 1976 and the Endangered Species Act.

Threatened and endangered species are designated under the Endangered Species Act (ESA). The four plants listed as threatened that occur in Idaho are Macfarlane's four-o'clock (*mirabilis macfarlanei*), water howellia (*Howellia aquatilis*), Ute ladies'-tresses (*Spiranthes diluvialis*) and Spalding's catchfly (*Silene spaldingii*). According to the USFWS, water howellia (*Howellia aquatilis*) and Ute ladies'-tresses orchid and their habitat are not found on the Nez Perce National Forest and will not be further addressed. The project area does not contain landscape characteristics, plant community composition, or community structure that would suggest suitable habitat for Spalding's catchfly or Macfarlane's four-o'clock, based on current knowledge of existing habitat for these species. According to the latest USFWS Species List Update 09/17/2012, no federally listed plant species or proposed critical habitat occurs on the Moose Creek Ranger District, therefore these species will not be considered further. Slickspot peppergrass (*Lepidium papilliferum*) has been recently listed as Proposed for Idaho, but this southern Idaho Species does not occur on the Nez Perce National Forest.

Sensitive species are those plant and animal species identified by the Regional Forester for which population viability is a concern, as evidenced by substantial current or predicted downward trends in population numbers, density, or habitat capability that reduce a species existing distribution. Management direction for sensitive species is to ensure that species do not become threatened or endangered because of Forest Service actions and to maintain viable populations of all native species. The most recent update to the sensitive species list was published on September 17, 2012. The Forest Service must evaluate impacts to sensitive species through a biological evaluation. All 30 sensitive plant species have been evaluated as to their presence, presence of their habitat, and whether the species or habitat may be potentially affected.

3.6.3 Analysis Methodology

Species information is based upon existing information, Idaho Conservation Data Center (CDC) data, GIS modeling of habitat parameters, photo interpretation, and field surveys. Individual species requirements were reviewed and appropriate modeling criteria selected to determine which species or corresponding habitat would be expected to occur in the project area.

A participating agreement between the Forest Service and the Idaho Natural Heritage Program resulted in rare plant surveys being conducted in the Clear Creek drainage during the summer of 2012. Botanists surveyed for rare plants and targeted coastal disjunct species. No Federally Proposed, Threatened, or Endangered Plant Species, or potential habitats were found during the surveys; therefore they will not be discussed further in this analysis. There would be no effects to these species from project activities. An Interim Report was published on September 28, 2012 (see project record).

A site visit and plant survey was conducted in August, 2012 by a Forest Service Botanist. The field survey was a spot check of various habitats and proposed "focus areas" that are being considered for treatments within the Clear Creek Drainage. Understory plant species included: Ninebark (*Physocarpus malvaceus*), ocean spray (*Holodiscus discolor*), wild ginger (Asarum *caudatum*), sitka alder (*Alnus sinuate*), western goldenthread (*Coptis occidentalis*), pearly everlasting (*Anaphalis margaritaceae*), common yarrow (*Achillea millefolium*), twinflower (*Linnaea borealis*), queen cup beadlilly (*Clintonia uniflora*), Montana golden pea (*Thermopsis montana*), common snowberry (*Symphoricarpos albus*), mountain maple (*Acer glabrum),* grouse whortleberry (*Vaccinium caespitosum*), prince's pine (*Chimaphila umbellate*), beargrass (*Xerophyllum tenax*), western wintergreen (*Gaultheria humifusa*), fools huckleberry (*Menziesia ferruginea*), and mountain ash (*Sorbus scopulina*).

3.6.4 Resource Indicators

Vegetation management, temporary road construction or restoration activities could directly affect some plant species. Indirect effects may include the expansion of weeds and the mitigating treatments of these infestations or changes to the forest canopy that may affect light and temperature regimes. Cumulative effects are the overall effects to species from past, present and reasonably foreseeable future projects. Historically such effects on individual species was not measured or noted. However, the past effects on general habitat condition can be qualified and matched to species dependent on a particular habitat. For this reason, local landtype classifications as described in the Vegetation section in Chapter 3 of the EIS (3.6.5.2 Ecological Settings and Vegetation Response Units) are used for the direct, indirect, and cumulative effects discussions. The primary settings within the analysis area are Idaho Batholith Breaklands, Idaho Batholith Uplands, and Idaho Batholith Subalpine. Since there are only 160 acres of Idaho Batholith Subalpine in the analysis area and none are proposed for treatment, the analysis will focus only on the Breaklands and Uplands settings. The effect on potentially suitable habitat is the primary indicator used in the analysis.

3.6.5 Affected Environment

Habitat within the Clear Creek project area vary from the moist uplands with stands dominated by mixed occurrences of grand fir (*Abies Grandis*), Douglas-fir *(Pseudotsuga menziesii*), Pacific yew (*Taxus brevifolia*), western larch (*Larix occidentalis*), Englemann spruce (*Piceea engelmannii*), and lodgepole pine (*Pinus contorta*), to the coastal disjunct habitats dominated by Western red cedar (*Thuja plicata*) with grand fir and Douglas-fir, to the dryer ponderosa pine (*Pinus ponderosa*) and Douglas-fir along the lower elevation breaklands. Ninety percent plus of the analysis area is currently in a closed canopy condition of various age classes of 40-plus years of age. Structural stages differ by the respective Vegetation Response Units (VRUs) but in general the Breaklands and Uplands trend low in the 0–40 age class and are overabundant in the 41–

100 year age class. Riparian Habitat Conservation Areas (RHCAs) designated as PACFISH buffers constitute approximately 24% of the analysis area and approximately 15% of the analysis is verified old growth (11%).(Also see EIS Vegetation sections 3.6.5.1 and 3.6.5.2).

3.6.5.1 Sensitive Species

Habitat does exist for 10 Sensitive Plant Species found on the Nez Perce National Forest, however only five of these sensitive species; Pacific dogwood (*Cornus nuttallii*), clustered ladyslipper (*Cypripedium fasciculatum*), light hookeria (*Hookeria lucens*), naked-stem (*rhizomnium nudum*), and evergreen kittentail (*Synthyris platycarpa*), are known to exist in the analysis area. During a survey of the site, no Forest Sensitive Plant species were found growing in any of the proposed “Focus Areas,” or areas proposed for treatment. Most of the known Sensitive Plant Species growing in the Clear Creek drainage are located in the upper reaches, where no treatments are planned, and along riparian areas of the watershed where habitat would be protected by implementation of PACFISH Riparian Habitat Conservation buffers.

According to records from the Idaho Conservation Data Center (ICDC) and field surveys (2012), potential habitat exists in the project area for 10 sensitive plant species. One of those species, evergreen kittentail was found to be much more abundant that previously thought, with estimates of over 1,000 individuals. Table 3-14 lists those plant species or their habitats that are present or potentially occur within the Clear Creek project. Sensitive species not included in the Table 3-14 are not known or suspected to occur in the project area, nor is suitable habitat present based upon existing information or habitat modeling. These species are accounted for in the Biological Evaluation. There are no occurrences or suitable habitat for Threatened or Endangered plant species in the project area.

Table 3-14. Potential Sensitive Plants within the Project Area

Common and Latin Name	Presence	Habitat/Community Type	Elevation (feet)
Deerfern *Blechnum spicant*	Potential	Coastal disjunct population in Idaho. Moist to wet forests general heavily shaded.	1,500–3,000
Lance-leaf moonwort *Botrychium lanceolatum* var. *lanc.*	Potential	A wide variety of habitats, including wet to moist grassy and rocky slopes, woods, and edges of lakes generally at fairly high elevations. Soils tend to be cold and mostly subacid.	1,500–6,000
Northern moonwort *Botrychium pinnatum*	Potential	Shaded moist sites under various conifers, Dry to moist meadows.	1,500–6,000
Green-bug-on-a-stick *Buxbaumia viridis* (moss)	Potential	Moist grand fir or cedar forests on large decayed logs and ash soils	1,500–5,000
Constance's bittercress *Cardamine constancei*	Potential	Occurs in moist coniferous woods along rivers and partial shade under western red cedar	1,300–3,000
Pacific dogwood *Cornus nuttallii*	Present	Coastal disjunct population in Idaho. Openings, gaps in low elevation cedar along the Selway River.	1,500–2,800
Clustered ladyslipper *Cypripedium fasciculatum*	Present	Partial shade of warm and moist cedar, grand fir or Douglas fir	1,600–4,800
Light hookeria *Hookeria lucens*	Present	Shaded areas on saturated soil in low elevation forests. Associated with riparian habitat.	Below 4,000
Naked-stem rhizomnium *Rhizomnium nudum* (moss)	Present	Low elevation moist and mesic conifer forests (including along streams)	2,000–5,000
Evergreen kittentail *Synthyris platycarpa*	Present	Openings, partial shaded sites, associated with grand fir mosaic.	4,000–6,600

3.6.6 Environmental Consequences

The effects analysis is based on evaluation of proposed activities occurring in potentially suitable habitat and the potential for those activities to directly or indirectly effect populations or habitat characteristics.

3.6.6.1 Direct and Indirect Effects

3.6.6.1.1 Alternative A—No Action

No management activities are proposed under this alternative; therefore, there would be no direct effects on plant species or habitats. Indirectly changes in stand structure would be expected through time, some of which would alter suitable habitats for some sensitive plant species. In mixed-conifer forest types, especially with grand fir and Douglas-fir, root disease and insects would continue increased tree mortality as the stands age and potentially create a higher degree of fire risk to the stands.

In general, species requiring late successional forests would see an improvement in habitat quality, while those requiring conditions that are more open would decline barring the absence of substantial fire or other forest disturbance agents such as severe wind or insect and disease epidemics. The increased severity of wildfire is possible due to the increased fuel build up in these areas from increasing insect and disease mortality.

3.6.6.1.2 Alternatives B, C, and D

No Forest Service Sensitive species were found during spot checks within proposed treatment areas. Of the sensitive species known to be present within the Clear Creek project area, only one, Evergreen kittentail was determined to be potentially affected. It was determined that the action alternatives may impact individuals but not likely to cause trend toward federal listing or reduced viability for the population or species because large numbers were found to be present within the Clear Creek drainage making it much more common than previously thought. Some of these plants occur on old road beds and the possibility exists that during proposed project activities, isolated individuals could be potentially affected by road reconstruction or culvert replacement **(**See botanical biological evaluation, available in Project Record).

The variable retention regeneration harvest is the primary harvest treatment that will appreciably change habitats from a primarily closed crown condition to openings with vertical retention of individual and clumps of leave trees. This harvest method will alter light and temperature regimes that will favor more early successional, shade intolerant plant and tree species and incur the most mechanical ground disturbance from harvest operations. The implementation of the Shelterwood harvest system, including commercial thinning and improvement cuts, has potential for moderate mechanical ground disturbance and increasing light and temperature dynamics but the overall habitat conditions likely would not change enough to affect most later successional, shade tolerant plant species. The prescribed fire in the western portion of the project area is located primarily in the breaklands with the objective of reducing ground and ladder fuels with a low-mixed severity fire and similarly will not likely change light and temperature dynamics substantially enough post burn to alter the existing potential plant habitat and existing species representation. Habitats preferred by late successional, closed canopy dependent species are generally associated with Riparian Habitat Conservation Areas (RHCAs) which are excluded from harvest under PACFISH guidelines. Additionally, all alternatives exclude harvest of verified old growth.

Idaho Batholith Breaklands comprise 33% of the analysis area (14,420 acres) and Idaho Batholith Uplands comprise 65% of the analysis area (28,225 acres). Variable retention regeneration harvest will appreciably alter the habitat for later successional and shade tolerant sensitive plant species by approximately 6% under Alternative B, 10% under Alternative C, and 5% under Alternative D within the analysis area as a whole. Under all action alternatives approximately 66% of the variable retention regeneration harvest acres will occur within the Idaho Batholith Upland classification and 34% of the acres within the Idaho Batholith Breaklands classification; 45% are in the 41–100 (years) age class and 30% are within the 101–149 (years) age class. Approximately three-quarters of the regeneration harvest occur in the grand fir/Douglas fir cover type (EIS, Vegetation, 3.6.6.2.1).

Potential habitat for ten sensitive plant species could be affected by the proposed variable retention regeneration harvest. Impacts range from detrimental to beneficial depending upon individual species biology and response. Due to the lack of known occurrences, low levels of potential habitat negatively affected, the relative abundance of the respective habitats remaining post-harvest, and the design criteria listed below, there are no threats to the viability of any sensitive plant species.

The following project design criteria would limit negative effects to sensitive and rare plant species:

- No harvest will occur within PACFISH buffers (24% of the analysis area)
- No harvest will occur within verified old growth
- Pre-sale personnel will report any occurrences or suspected occurrences of sensitive plant species to the Zone Botanist to evaluate the need for mitigation measures.

Road decommissioning and reconstruction would maintain current conditions for rare and sensitive plants. Generally, old roads that are candidates for decommissioning do not provide habitat for these species. Temporary roads are a direct disturbance to suitable habitats. Temporary road segments were sorted by potential habitats for sensitive plant species, and it is assumed that for each mile of road constructed approximately 2.5 acres of habitat would be reduced over the short term. A total of 69 acres of habitat could be affected under Alternatives B and C and 22 acres could be affected under Alternative D. Sites for proposed soil restoration or stabilization generally are not considered suitable habitat, thus are not considered when determining the effects of this project.

Several watershed improvements are proposed where roads currently cross streams. These riparian areas provide habitat for several sensitive plant species. There is a possibility for negative mechanical effects to species in the immediate vicinity of the road. However, such effects would be anticipated to be rare and negligible because the work would be almost entirely limited to the road crossing itself with little or no impact to the adjacent grounds.

3.6.6.1.3 Sensitive Plant Effects Determinations

Determination of effects on sensitive plant species by management activities are summarized below by alternative. Only plant species that have potential habitat in the project area are included in Table 3-15.

Table 3-15. Summary of Effects for Regional Designated Sensitive (S) Plant Species (Includes All Action Alternatives)

Latin Name	Common Name	Cat.	Species Present	Habitat Present	Species Potentially Affected	Habitat Potentially Affected	Determination
Blechnum spicant	Deerfern	S	No	Yes	No	No	NI
Botrychium lanceolatum var. lanc.	Lance-leaf moonwort	S	No	Yes	No	No	NI
Botrychium pinnatum	Northern moonwort	S	No	Yes	No	No	NI
Buxbaumia viridis (moss)	Green-bug-on-a-stick	S	No	Yes	No	No	NI
Cardamine constancei	Constance's bittercress	S	No	Yes	No	No	NI
Cornus nuttallii	Pacific dogwood	S	Yes	Yes	No	No	NI
Cypripedium fasciculatum	Clustered ladyslipper	S	Yes	Yes	No	No	NI
Hookeria lucens	Light hookeria	S	Yes	Yes	No	No	NI
Rhiz nudum (moss)	Naked-stem rhizomnium	S	Yes	Yes	No	No	NI
Synthyris platycarpa	Evergreen kittentail	S	Yes	Yes	Yes	No	MI

Note: Sensitive Species Determination is NI = No Impact; **BI** = Beneficial Impact; **MI** = May Impact individuals or habitat but not likely to cause trend toward federal listing or reduce viability for the population or the species; **LI =** Likely to impact individuals or habitat with the consequence that the action may contribute towards federal listing or result in reduced viability for the population or species.

As stated under the regulatory framework the objective for managing sensitive species is to ensure population viability throughout their range on National Forest lands and to ensure they do not become federally listed as threatened or endangered. The forest plan supports this direction but does not set specific standards and guides for sensitive plants. The alternatives are consistent with this direction to the extent that proposed management actions would not adversely affect viability of existing sensitive plant populations.

3.6.6.2 Cumulative Effects

Discussion of cumulative effects for rare plants is addressed through the general trend of the suitable habitat required by these species as a result of past, present and future management actions.

3.6.6.2.1 Geographic Boundary

The cumulative effects boundary includes all lands within the proposed treatment area and the roads used for access. The rationale for this is that the effects are site specific to treatment areas and would not extend beyond the boundaries, and effects from outside the defined area would likewise not affect the resource within.

3.6.6.2.2 Time Frame

It is not possible to quantify effects of specific activities that are several years or decades old. The status and occurrence of sensitive and rare plants was completely unknown for much of the management history of the watershed. The historic changes in condition and abundance of specific habitats are also largely unknown. Therefore, the effects of these past projects can only be qualified through general discussions.

3.6.6.2.3 Past, Present and Foreseeable Future Actions

Past and present timber harvest, grazing, road construction, exotic plant treatment, wildfire suppression, and prescribed fire have influenced rare plants in the project area.

Timber harvest began in the 1960s and averaged approximately 3,900 acres per decade up until 2000 through 2009 when only 1,400 acres were harvested. In addition, advancement in harvest operations, logging technology, best management practices, including retention of PACFISH buffers has significantly reduced timber harvest resource impacts. Regeneration timber harvest has occurred on approximately 22% of the project area with an associated 190 miles of roads. No-harvest buffers appear to have been retained since the 1960s on all but about 8% of the units. On the majority of the units (92%), buffers were a minimum of 50 feet wide. A total of 440 acres of regeneration harvest have occurred in the project area since PACFISH was implemented and appropriate-sized buffers were retained. All of the past regeneration harvests have been regenerated and most (>70%) have reached a crown closure condition. Roads within the project area constructed to support past timber sales are generally well located on the upper third of slopes or on ridge tops. 77% of these roads are graveled to reduce sediment. There are no reasonably foreseeable future timber sales identified within the analysis area. Past timber harvest and associated road construction are considered part of the existing condition.

Road decommissioning started in the 1990s and has increased since, including a recent 2011 decision to decommission 85 miles of system and non-system roads within the watershed. The decommissioning includes 3.5 miles of roads in RHCAs and at least 11 stream crossing removals. Thus far approximately 60 miles have been decommissioned and the rest will occur in 2014 prior to on the ground implementation of this decision. The existing condition includes all past road building, fish passage culvert replacement, and decommissioning activities through 2012. The activities considered for cumulative effects are proposed project road decommissioning and road reconstruction activities in combination with the Brown Spring Creek Culvert Replacement Project (2013/2014), the proposed Clear Ridge Non-System Road Decommissioning Project (2014 and beyond), and 2 culvert replacements on county roads in lower Clear Creek that occurred in 2011.These activities will require NEPA decisions and Rare and TES plant species will be evaluated at the project scale at that time.

Grazing is occurring in the project area however it is relatively small in scale and consists primarily of transitional range and there are currently no issues in regard to riparian impacts associated with grazing. There is very little if any effect from livestock grazing within the late successional, closed canopy habitats because of access and lack of desirable forage. There are two grazing allotments within the project area, Corral Hill and Tahoe/Clear Creek. Each allotment is authorized 110 cow/calf pairs, with 843 Animal Unit Months (AUMs) for Corral Hill and 583 AUM's assigned to Tahoe/Clear Creek. An Adaptive Management Environmental Impact Statement is currently being developed for these two allotments as part of a larger landscape assessment of grazing that includes 15 grazing allotments covering 350,000 acres. A decision is expected in 2014 or 2015. Past and current grazing impacts are considered as part of the existing condition.

Wildfire is aggressively suppressed as 94% of the project area is within the Wildland Urban Interface. The largest wildfires burned 27,245 acres between 1870 and the 1931 fire, which burned approximately 11,000 acres, primarily within the Clear Creek Roadless Area. Only 155 acres have burned since then because of the emphasis on fire suppression. All fires are aggressively suppressed within the project area, therefore fire suppression effects have been minor as most are extinguished at less than 0.25 acres. All past wild and prescribed fire effects are considered as part of the existing condition. Other than the prescribed fire associated with this analysis, there are no reasonably foreseeable management prescribed fire planned for the future.

Noxious weed spraying in the project area has been primarily associated with open roads as they represent the highest weed susceptibility in the project area. Noxious weed control or containment has primarily occurred during the past two decades and has generally consisted of spot spraying targeting specific noxious weeds including the common weeds of thistle, hounds tongue, and knapweed. Noxious weed management will continue into the future focusing on high susceptibility areas under current Forest direction. Past noxious weed treatment are considered part of the existing condition.

Some activities such as trail maintenance, road maintenance, recreation site maintenance, access management, and others are considered routine and ongoing and collectively would have negligible impacts on species or habitats of concern.

Most potential habitat for sensitive species occurs in the moister forests in the uplands and riparian areas. Moonworts, green bug-on-a-stick, clustered lady's slipper, naked-stem rhizomnium, light hookeria, and evergreen kittentail could potentially occur in these habitats. Moderately moist, cool habitats comprise 66% of the project area and are characterized by moderately cool temperatures and a variety of moisture regimes. There would be little to no cumulative effects to these species and the overall habitat trend would be static. Bug-on-a-stick occurs on open ground in a variety of habitats, many of which could be affected by management. However, the preferred open conditions would generally preclude disturbance activities such as timber harvest.

The warmer Grand Fir habitats comprise 33% of the project area, primarily in the lower, warmer elevations associated with the mid-reaches of Clear Creek. Much of this zone has seen substantial management activity in the past. Mid-seral forest structure is increased due to even-aged management. Road densities are relatively high in portions of the zone. These disturbances have declined dramatically in recent years and road density has been decreased.

3.6.6.2.4 Alternative A—No Action

Alternative A would produce no additional effects on potential rare plant habitat as compared to past activity levels. The progression of forest succession would improve habitat for most sensitive plant species. However, the decline of successional tree species due to insect-caused mortality may cause localized openings and increases in light and fuel loads, which could lead to more intense wildfires and damage to rare plants.

3.6.6.2.5 Alternatives B, C, D

Approximately 35% of the project area has been affected by timber harvest activities in the past sixty years. Proposed Activities under the action alternatives would temporally affect between 5% and 10% of the potential habitat for several sensitive plant species. Alternatives B, C, or D adds short-term disturbance associated with variable retention regeneration harvest and temporary road construction to approximately 5%–10% of the landscape which has not previously been harvested. 14% to 17% of the acres proposed under the action alternatives includes commercial and pre-commercial thinning and occurs on previously harvested acres with the objective of improving growth with stocking control. The commercially thinned acres will continue to provide potential habitat for sensitive plant species requiring partial to full shading now and into the future. Retention of PACFISH buffers and all verified old growth will continue to provide critical potential habitat for sensitive plant species. The concept of designing larger patch sizes, both young and old, across the landscape under all of the action alternatives will reduce habitat fragmentation into the future and improve habitat conditions for sensitive plant species by connecting older forest with riparian areas to create larger, connected patches of older forest preferable to many sensitive species. Openings created by the variable retention regeneration harvest under all action alternatives, while detrimental to some sensitive plant species habitat requirements could be beneficial to others with early seral habitat requirements. The proposed activities under the action alternatives along with ongoing and reasonably foreseeable future management activities would result in a slight decrease in potentially suitable sensitive plant habitat. Long-term trends would be static to slightly downward. A slight downward trend in habitat quality would not lead to concerns for population viability since these habitats are common across the project area.

3.6.6.3 Irreversible or Irretrievable Effects

None of the alternatives would implement actions or activities that would result in an irreversible commitment of resources as related to sensitive plants.

3.7 ROADLESS AREAS

The purpose of this analysis of the Idaho Roadless Areas and unroaded resource is to disclose the project's potential effects to roadless and wilderness attributes and determine whether it might affect future consideration for wilderness recommendations. This analysis focuses on the potential effects of project activities on wilderness characteristics as defined in the FSH 1909.12 (72.1). The analysis for the effects on other roadless resource attributes such as water resources, soils, and wildlife habitat can be found in other sections of this EIS. The 2008 Idaho Roadless Rule (36 CFR 294, subpart C) integrated local management concerns and the need to protect these areas in concert with the national objectives for protecting roadless area values and characteristics.

The final Idaho Roadless Area rule designated 250 Idaho Roadless Areas and established 5 management themes: Wild Land Recreation, Special Areas of Historical and Tribal Significance, Primitive, Backcountry Restoration, and General Forest, Rangeland, Grassland. Allocation of an area to a specific theme does not mandate or direct the Forest Service to propose or implement any action in that area; however, management theme designations do determine permitted and prohibited activities. Certain activities, such as road building, mineral development, and timber cutting, are permitted in some themes and prohibited in others; other activities, such as motorized travel, grazing, and motorized and mechanized use, are not changed by this rule. Nez Perce National Forest Plan management direction states that roadless areas will not be managed for wilderness.

The term "roadless area" refers to an area of at least 5,000 acres that does not have developed and maintained roads and is substantially natural in condition. A roadless area is specifically defined as an area that meets the minimum criteria for wilderness. Unroaded lands have natural characteristics similar to those of roadless areas but occupy less acreage. Wilderness characteristics include natural integrity, undeveloped characteristics, outstanding opportunities for solitude and primitive unconfined recreation, special features and values, and manageability. The purpose of this analysis is to evaluate the environmental consequences of the proposed alternatives on the wilderness characteristics of the Clear Creek Roadless Area.

3.7.1 Analysis Area

The analysis area is the 9,200-acre Clear Creek Roadless Area. The Clear Creek Roadless Area is designated as a *backcountry restoration* theme under the 2008 Idaho Roadless Rule.

The Clear Creek Roadless Area is located at the head of Clear Creek along the western boundary of the Nez Perce National Forest. Private property adjoins this area on the northwestern boundary. The nearest roads are spurs of Road 1842 on the north, Road 650 on the west, and Road 286 on the east, but some of these roads are closed during the general hunting season to mitigate impacts on big game.

Elevation ranges from 2,000 feet on Clear Creek at the forest boundary to 4,600 feet at China Point Ridge and the headwaters of Solo and Kay creeks. Topography is mountainous with steep slopes (commonly over 70%) paralleling the drainages. Ridgetops are relatively flat.

The Clear Creek drainage has been a significant part of the Nez Perce Forest timber sale program since the late 1950s. Most of the acreage remaining in the Clear Creek Roadless Area has burned twice, once in 1870 and again in 1931, leaving about 7,000 acres covered with brushfields in the South Fork and Middle Fork drainages of Clear Creek. Previous conifer forests have never reestablished themselves.

Vegetation in the area ranges from very moist, warm cedar habitat types to drier, warm Douglas-fir habitat types. Shrub coverage in the brushfields is primarily maple, willow, serviceberry, and various other shrubs. Bordering the brushfields are patches of young (approximately 70-year-old) timber, a mix of grand fir, Douglas-fir, and western redcedar. Understories are sparse but contain a variety of moist-site plants. Some natural meadows exist in upper Kay Creek in Section 28.

The brushfields have been important big game (elk and moose) winter range, but the preferred browse species—redstem, willow, mountain maple, and serviceberry— have in recent years grown out of reach of the animals. Prescribed fire has been used in an attempt to increase the value of the range. Current uses of the area include livestock grazing, big game winter and summer range, fishing, hunting, and mining.

3.7.2 Resource Indicators

Issue: A commenter expressed concern that the impacts on the Roadless Area must be evaluated in relation to its designation as proposed Wilderness in the Northern Rockies Ecosystem Protection Act.

Indicator: Wilderness values, impacts of the project on future wilderness designations

The following resource indicators were used to compare the effect of the alternatives:

- ***Natural Integrity*—**The extent to which long-term ecological processes are intact and operating
- ***Undeveloped characteristics*—**The degree to which developments and uses are apparent to most visitors
- ***Outstanding opportunities for solitude or primitive unconfined recreation*—** Solitude is a personal, subjective value defined as the isolation from sights, sounds, and presence of others and from developments and evidence of humans. Primitive recreation is characterized by meeting nature on its terms, without the comfort and convenience of facilities.
- ***Special features and values*—**Unique ecological, geographical, scenic, and historical features of an area
- ***Manageability*—**The ability to manage an area for wilderness consideration and maintain wilderness attributes

3.7.3 Affected Environment

3.7.3.1 Natural Integrity

Past wildfires in the Clear Creek area and the resulting vegetative succession are some of the natural processes that have occurred. The landscape is prone to fire, and numerous natural ignitions occur every year. Fire management strategies for the area dictate full suppression, however, due to the Roadless Area's proximity to private property and location within a Community Protection Zone. Opportunities for management of naturally occurring wildfire are limited.

3.7.3.2 Undeveloped Characteristics

Past road building and timber harvest along the southern and eastern portions of the Roadless Area are readily apparent. The private property interface on the westernmost boundaries is highly segmented with numerous corners. The area has several grazing permits, and cows are a common occurrence.

3.7.3.3 Special Features and Values

No special features or values have been identified for the Clear Creek Roadless Area.

3.7.3.4 Opportunities for Solitude and Primitive Unconfined Recreation

This small area, with nearby logging activity, offers limited opportunity for solitude. Vegetative screening is high, however. The main opportunities here are bushwhacking and following game trails through dense brushfields.

3.7.3.5 Manageability

This area has been reduced by at least 14,800 acres since 1979, almost entirely because of timber sales. The area boundary is imprecise except where it coincides with the forest boundary. The area boundary has been drawn to exclude existing roads from the remainder of the area.

3.7.4 Environmental Consequences

3.7.4.1 Direct and Indirect Effects

3.7.4.1.1 Alternative A

No activities are proposed under Alternative A; therefore, under this alternative, the Clear Creek Roadless Area would remain in its current condition. No direct effects would occur to the wilderness characteristics of the area (i.e., the area's natural integrity, undeveloped characteristics, opportunities for solitude or primitive unconfined recreation, or manageability).

Continued fire suppression and lack of disturbance may indirectly cause the area to trend away from desired conditions and may affect the natural quality of the area over time. Shrubfields would continue to become decadent and would be unusable by wintering wildlife. Timber stands could become more susceptible to large-scale stand-replacing wildfire because mosaic conditions would not exist on the landscape.

3.7.4.1.2 Alternatives B, C, and D

Alternatives B, C, and D would implement low-mixed severity prescribed fire on approximately 1,400 acres within the Clear Creek Roadless Area over a period of several years. Other activities proposed in Alternatives B, C, and D fall outside the Roadless Area and do not infringe on potential wilderness values; therefore, they are not discussed in this analysis.

Implementation of prescribed fire would likely be accomplished using aerial (helicopter) and hand ignitions. Extensive pumps, hoselays, and hand-constructed control lines would probably be needed to control the fire along the private property interface on the westernmost portion of the Roadless Area.

Natural Integrity

Implementation of the action alternatives would have a ***beneficial effect*** to the natural qualities of the area because disturbance would be sustained, although the mechanism of disturbance would be human caused and not natural. Where prescribed fire coincides with decadent shrubfields, species such as maple, willow, and serviceberry would be rejuvenated and become more available as browse for wintering wildlife. In timbered areas, the mixed-severity mosaic caused by burn would create patches of early successional forest that would ensure a balanced range of age classes distributed across the Clear Creek watershed.

Undeveloped Characteristics

Implementing Alternatives B, C, or D would cause ***little effect*** to the undeveloped characteristics of the Roadless Area. Low- to mixed-severity prescribed fire closely emulates the effects of wildfire under a wide range of climate and environmental conditions. Visitors would not likely be able to distinguish whether the fire was human caused or natural. A site-specific burn plan would be developed for the project and would document the desired effects and the environmental variables necessary for implementing the prescribed fire to meet objectives.

Handline construction along the private property interface may temporarily alter the undeveloped characteristics of the Roadless Area, although property/boundary line location and establishment—including limbed trees and painted boundaries—has already altered this area. Fuels along the boundary are generally light and include open ponderosa pine, shrubs, and harvested private grounds. Handline construction (including limbing trees, removing brush, and light ground scalping in combination with pumps and hoselays to control the burn) is expected to be minimal. Rehabilitation of the handlines following implementation would further reduce the evidence of development, and no evidence is expected to be visible several years after rehabilitation.

Special Features or Values

Since no special features or values have been identified for the Clear Creek Roadless Area, implementing Alternatives B, C, or D would cause ***no effect*** to this category of wilderness characteristics.

Opportunities for Solitude and Primitive Unconfined Recreation

Opportunities for solitude and primitive unconfined recreation would be ***temporarily affected*** during implementation of the prescribed fire. Trails 130 and 728 would likely be temporarily closed to allow for safe implementation of the burn. During ignition, sights and sounds of helicopters would likely be heard throughout the Roadless Area, although these disturbances would be expected to last only a short time. Crews operating pumps, hoses, and chainsaws would have less effect on solitude and unconfined recreation, since their activities would be confined to a small area immediately adjacent to the private property boundary in the westernmost portion of the Roadless Area.

After implementation, the opportunities for solitude and primitive unconfined recreation would remain unchanged from their current state.

Manageability

No effect to the manageability of the Roadless Area would result from implementation of Alternatives B, C, or D. None of the activities proposed in any of these alternatives would have an effect on the current or future location of the Roadless Area boundary.

3.7.4.2 Cumulative Effects

The cumulative effects boundary for this analysis is the Clear Creek Roadless Area. This boundary was selected because roadless areas are generally the pool from which future wilderness designations occur. The Clear Creek Roadless Area was proposed for wilderness designation in the *Northern Rockies Ecosystem Protection Act*.

A forward-looking timeline to measure cumulative effects is difficult to establish, as wilderness designations can be a lengthy political process. However, if the area were designated as Wilderness, it might reasonably be expected to receive higher than ordinary use, given its close proximity to towns and relative ease of access.

As pointed out above, the Clear Creek Roadless Area has shrunk by almost 15,000 acres since 1979 as a result of timber sales. The current Roadless Area boundary is imprecise and drawn to exclude timber sale areas. With the exception of prescribed fire, none of the activities proposed in Alternatives B, C, or D would affect, alter, or infringe upon the current Roadless Area boundary or have an effect on the wilderness values inside the Roadless Area.

Management of naturally occurring wildfire to benefit resources in this Roadless Area is not likely due to the area’s close proximity to private lands and managed timberlands. Fire suppression is likely to continue. The prescribed fire proposed within the Clear Creek Roadless Area would sustain disturbance in a disturbance-dependent landscape, resulting in a beneficial cumulative effect to the natural qualities of the area.

Because the implementation of Alternatives B, C, or D will have no effect, limited temporary effects, or beneficial effects to the wilderness characteristics of the area, the project will not alter the area's potential to be considered for future wilderness designation.

3.8 Soils

This report summarizes the effects of the alternatives on the soils resource. This section was summarized from the "Clear Creek Integrated Restoration Project Soils Report," located in the project record.

3.8.1 Analysis Area

The areas assessed for soils concerns are the individual treatment units (variable acres) and associated skid trails, landings, and temporary roads within the 43,700-acre project area.

3.8.2 Regulatory Framework

Forest Plan direction and the following federal and state laws and regulations pertaining to the management of soil resources would be applied to the project:

- FSM 2500 Watershed and Air Management – Washington Office (WO) Amendments 2500-2010-1 and 2500-2010-2 and Northern Region (R1) Supplement 2500-14-1 (Regional Soil Quality Standards)
- Soil and Water Conservation Practices (SWCPs) Handbook - FSH 2509.22
- Idaho Forest Practices Act (1974)
- National Forest Management Act of 1976 (NFMA) 16 USC 1604(g)(3)(i)
- 36 CFR 219.20

3.8.2.1 Nez Perce Forest Plan

3.8.2.1.1 Forest Plan Amendment

The Forest Plan (USDA Forest Service 1987a) determined that for any project, soil productivity will have been maintained and any irreversible impacts to the soil resource will have been minimized (USDA Forest Service 1987a, p. II-2, Goal 18).

Forest Plan Soil Quality Standard #2 (II-22) would be amended for Alternatives B, C, and D (See Appendix C). This site-specific amendment for lands within the project area would replace the Forest Plan standard of 20% DSD with the more restrictive Region 1 Soil Quality Standards limiting detrimental disturbance to 15% (see below). The amendment would also allow the project to proceed with the treatment of 3 units that currently exceed the 20% Forest Plan standard with the concurrent implementation of soil improvement activities.

Region 1 Soil Quality Standards (FSM 2500 Supplement 2500-14-1) specify:

> "Where detrimental soil conditions from past activities affect 15 percent or less of the activity area, a cumulative minimum of 85 percent of the activity area shall

> not be detrimentally compacted, displaced, or puddle upon completion of activities.
>
> Where detrimental soil conditions from past activities affect more than 15 percent of the activity area, the cumulative detrimental soil disturbance from project implementation and past activities shall not exceed the conditions prior to the planned activity and shall provide a net improvement in soil quality."

The detrimental disturbance that was created in the three units over 20% occurred in 1964 and 1970. These activities occurred prior to the 1987 Nez Perce Forest Plan standards, which limit extent detrimental disturbance to 20%. Both the current Forest Plan standards and Regional soil quality guidelines provide direction to maintain soil productivity. The amendment would better align Forest Plan standards with the Regional soil quality standards. The Regional standards are more restrictive—stipulating that detrimental disturbance stay below 15% as opposed to the 20% currently prescribed in the current Nez Perce Forest Plan. The proposed amendment would change the Forest Plan standards, and allow activities to occur and provide for concurrent soil restoration in detrimentally disturbed areas. Soil improvement activities would help the soil to recover at a faster rate; establishing healthier, more productive soils.

3.8.2.1.2 Consistency with Forest Plan and Environmental Law

The Clear Creek project was designed to meet the standards set forth in the Idaho Forest Practices Act, FSM 2500—Watershed and Air Management and Northern Region (R1) Supplement 2500-99-1 (Regional Soil Quality Standards), and FSH of Soil and Water Conservation Practices (FSH 2509.22).

The project complies with 36 CFR 219.20, which requires conservation and protection of soil and water resources and NFMA 16 USC 1604(g)(3)(E)(i), which states "Soil, slope or other watershed conditions will not be irreversibly damaged."

Nez Perce Forest Plan standards listed on page II-22 of the Plan would also be met, including the Forest Plan amendment for the project (Table 3-16).

Table 3-16. Forest Plan Compliance for Soil Resources

Standard Number	Subject Summary	Compliance Achieved By
1	Evaluate the potential for soil displacement, compaction, puddling, mass wasting, and surface soil erosion from ground-disturbing activities.	Landtype identification and evaluation Field surveys using Regional standards were conducted on each of the proposed Activity Areas (units).
2	A minimum of 80% of an Activity Area shall not be detrimentally compacted, displaced, or puddled upon completion of activities. This would be amended to follow R1 standard limiting DSD to 85% (see Appendix C).	Post-project monitoring to verify compliance and to assess if additional mitigation is needed. Soil improvement activities on areas with prior impacts to achieve a net improvement in soil productivity.
3	Maintain sufficient ground cover to minimize rill erosion and sloughing on road cut and fill slopes and sheet erosion on other Activity Areas.	Project design features were developed to minimize erosion. Temporary road locations were evaluated in the field. Unit-specific design measures were developed for high subsurface erosion areas.
Forest Plan Amendment (incorporates R1 soil standard)	Where detrimental soil conditions from past activities affect more than 15% of the Activity Area, the cumulative detrimental soil disturbance from project implementation and past activities shall not exceed the conditions prior to the planned activity and shall provide a net improvement in soil quality.	Soil improvement activities on areas with prior impacts to achieve a net improvement in soil productivity Post-project monitoring to verify compliance and to assess if additional mitigation is needed.

3.8.3 Resource Indicators

3.8.3.1 Soil Stability and Erosion Hazard Potential

Soil erosion can result in loss of soil productivity due to surface soils moving downslope and thus removing the materials with the greatest ability to hold moisture and nutrients. Compared to the subsurface soils, surface soils in the project area contain more organic matter and have a higher volcanic ash-derived mineral content. Removal of vegetation and/or ground disturbance associated with timber harvest or fire can increase erosion on certain landtypes.

Indicator: Acres of proposed skid trail/landings and miles of proposed temporary roads on landtypes with a high subsurface erosion hazard

3.8.3.2 Soil Productivity

Past management activities in the project area have caused Detrimental Soil Disturbance (DSD) and decreased soil productivity. According to the Region 1 Soil Quality Standards, detrimental disturbance (e.g., compaction, displacement, erosion, loss of organic matter) from management activities should not exceed 15% of an Activity Area and coarse woody material retention should be appropriate to the habitat type. In areas that exceed 15% detrimental disturbance, the combined detrimental disturbance effects of the current project (implementation and restoration) should not exceed the disturbance levels present before the activity, and activities should be directed toward a net improvement in soil quality.

Indicator: Number of commercial harvest units requiring specialized project design measures to meet Regional soil standards

3.8.4 Analysis Methodology

Reports and maps generated by GIS, aerial photos, and field reviews were used to analyze effects to the soil resource from the project's proposed activities. Field sampled vegetation database (FSVeg) queries were conducted to identify past harvest activities and their time frames (see project file). All proposed harvest units were examined in the field to assess past management impacts and to evaluate potential effects to soils. Surveys following protocols outlined in the Region 1 Approach to Soils NEPA Analysis Regarding Detrimental Soil Disturbance in Forested Areas (USDA Forest Service 2009b) were conducted to determine the percentage of DSD in each of the proposed harvest units (Activity Areas). An erosion hazard assessment was used to summarize erosional characteristics based on landtype properties. This assessment described overall erosion hazards in the project area and at the unit scale to aid in the development of project design measures.

Potential soil restoration opportunities throughout the project area were assessed, with a focus on old skid trails, landings, and roads. Project design features describe methods for minimizing impacts to the soil and techniques for restoring soil biophysical integrity.

3.8.4.1 Data Assumption and Limitations

The methodology outlined in the Region 1 Approach to Soils NEPA Analysis Regarding Detrimental Soil Disturbance in Forested Areas (USDA Forest Service 2009b) provides a conservative assessment of existing soil conditions (Page-Dumroese et al. 2006a), given its inherent assumptions (ocular data and soil pits).

Informal comparisons found that both for single observers and between observers, category calls in this methodology have a variability of 5%. This level of survey leads to a 90%–95% confidence with error bars from 5% to 8%, depending on the amount of disturbance found. The surveys achieve statistical inference for units with either low disturbance (<7%) or moderately high disturbance (>23%) (Page-Dumroese et al. 2009).

Field soil survey methodology based on visual observations can produce variable results among observers, and the confidence of results is dependent on the number of observations made in an area (Page-Dumroese et al. 2006a). The existing and estimated values for DSD are not absolute and are best used to describe the existing soil condition. The calculation of the percentage of additional DSD from a given activity is an estimate, since DSD is a combination of such factors as existing ground cover, soil texture, timing of operations, equipment used, skill of the equipment operator, the amount of wood to be removed, and sale administration. The DSD estimates for proposed project activities are mostly based on local monitoring and research results (Archer 2008; Reeves et al. 2011). The DSD estimates of proposed activities also assume that BMPs would be implemented and that soil recovery occurs over time.

3.8.4.2 Scientific Uncertainty and Controversy

Site and soil productivity relies on complex chemical, physical, and climatic factors that interact within a biological framework. For any given site and soil, a change in a key soil variable (e.g., bulk density, soil loss, and nutrient availability) can lead to changes in potential soil productivity. Defining the threshold at which productivity is detrimentally disturbed is controversial. The rationale for the 15% limit of change in soil bulk density was largely based on the collective judgment of soil researchers, academics, and field practitioners, and the accepted inability to detect changes in productivity less than 15% using current monitoring methods (Powers 1990). Powers (1990) states that the soil quality guidelines are set to detect a decline in potential productivity of at least 15%. This statement does not mean that the Forest Service tolerates productivity declines at this level, but that it recognizes problems with detection limits.

Soil quality standards are being studied by a cooperative research project called the North American Long-Term Soil Productivity Study (LTSP). The 5- and 10-year results were recently published (Page-Dumroese et al. 2006b; Fleming et al. 2006; Sanchez et al. 2006). The LTSP study is ongoing and provides the best available science to resource professionals. In a 10-year study, no observed reduction in tree growth occurred as a result of compaction or organic matter removal in plots with soils generally similar to those found in the project area (silt loam) (Powers et al. 2005). These results are relatively short-term and involve many site- and soil-specific factors. Future results from the ongoing study should be helpful for assessing harvest practices on soil productivity.

Additional controversy surrounds the use of the term “irreversible” in the NFMA. The NFMA has guidelines that “insure that timber will be harvested from NFS lands only where soil, slope, or other watershed conditions will not be irreversibly damaged.” The DSD described in this analysis does not necessarily result in substantial and permanent impairment.

DSD is reversible if the processes (organic matter accumulation, moisture, topsoil retention, and soil biota) are in place and if time is allowed for recovery. Irreversible damage to soils in the project area could result from the loss of the volcanic ash cap through erosion or removal by excavation for temporary roads and/or skid trails. Soil recovery could still occur in remaining subsurface soils, yet the exceptionally high porosity and water-holding properties of the Mazama ash cap would likely be irrecoverable.

3.8.5 Affected Environment

3.8.5.1 Landforms and Geology

Soil characteristics in the project area vary according to slope gradient, slope aspect, parent material, texture, depth, vegetative cover, and microclimate. Landforms in the project area are mostly dissected mountain breaklands (58%) and low- and moderate-relief rolling uplands (33%).

The geologic substrate is primarily Belt Zone and Border Zone metamorphics (45%), followed by Idaho Batholith Border Zone granitics (35%) and Columbia River basalt

(15%). Soil parent material is primarily granitic (85%), with inclusions of basalt (8%) and sedimentary rock (3%). Surface soils are generally silty or sandy loams. The coarse fragment content in the soils is very low, generally between 5% and 10%, increasing the susceptibility of the soil to compaction and rutting from ground-based machine harvesting. More than half of the ground cover is litter; approximately 35% of the units have vegetative cover, and only 2% have bare soil.

Much of the area is overlain by a mixed to intact layer of Mazama volcanic ash, ranging from 7 to 20 inches in thickness. The ash cap is thin or missing in the steeper breaklands. Ash material is physically highly favorable to root growth, being very permeable and possessing a high ability to hold moisture and nutrients. Its presence as an intact layer with little mixing is an indication of relatively stable slopes over the past 6,700 years since the ash deposition.

3.8.5.2 Landslide and Erosion Hazard Potential

Landtypes are ecological land units categorized by similarities in soils, landforms, geologic substrate, geomorphic processes, and plant associations (Cleland et al. 1997). These land units have been mapped for the entire Nez Perce National Forest. Landtypes were identified for the project area to help focus field evaluations and to pinpoint any erosion hazard concerns.

Landslides are the dominant natural erosion process in the project area. Landslide-prone (LSP) areas mapped on the Nez Perce National Forest are located on slopes over 60% and landtypes 50EUU and 50CUU. Areas considered highly prone to landslides comprise approximately 11% of the project area.

3.8.5.3 Soil Productivity

Soils in the project area are generally silt loams, formed from loess and overlain with a moderately deep volcanic ash layer. Past natural and management activities have impacted the productivity of these soils.

During the summer of 2012, field surveys were conducted on each of the proposed harvest and burn units to assess the extent of compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movements. Existing detrimental soil conditions within the units range from 0% to 22% (see project file). Soil disturbances found during the surveys included old benched roads, skid trails, dozer piling, soil displacement, rutting, and compaction. Three units exceed the 20% Forest Plan Standard; therefore, a Forest Plan amendment is needed to proceed with project activities, including concurrent soil restoration, so the units will be trending positive. The project area also includes 19 units that are currently over the 15% Regional Soil Quality Standard.

Although not specifically addressed by a Forest Plan standard, the presence of aboveground organic matter or woody material is an important component of soil health. The retention of coarse (>3 inches in diameter) woody material is essential to maintaining soil productivity (Graham et al. 1994). Regional direction (Forest Service Manual) for organic material recommends following guidelines such as those contained in Graham et al. (1994) if more-specific local guidelines have not been developed.

Graham et al. (1994) recommend 7–33 tons/acre of coarse woody material (depending on habitat type, moisture regime, and aspect). This amount should provide sufficient nutrients and organic material for soil productivity in the long term (100–300 years). Retaining existing coarse wood levels and allowing for recruitment through the natural addition of snags and/or standing trees would facilitate these benefits. Existing down woody material ranged between 0 and 43 tons/acre in units proposed for project activities, with an average of 11 tons/acre (visual observation). Litter and duff layers throughout the project area average 6 centimeters in depth.

3.8.6 Environmental Consequences

The spatial scope for direct, indirect, and cumulative effects is the individual commercial units (variable acres) and associated temporary roads. The temporal scope for direct and indirect effects is several decades (30–50 years), covering both pre- and post-project activities. The only activities analyzed in detail are commercial harvest units and associated temporary road construction and prescribed burning.

3.8.6.1 Activities Not Analyzed in Detail

Precommercial thinning: The project includes 1,793 acres of proposed precommercial thinning activities. Because precommercial thinning only utilizes hand tools and no ground-based mechanized equipment, this activity would not increase DSD in the project area. Precommercial thinning units were not surveyed.

Road Reconditioning and Reconstruction: Forest system roads are not considered in the determination of potential DSD (FSH 2509.18). Approximately 170 miles of road reconditioning and reconstruction is proposed under Alternatives B, C, and D and would improve road drainage and reduce the risk of mass erosion.

Road Decommissioning: Forest system roads are not considered in the determination of potential DSD (FSH 2509.18). Approximately 13.8 miles (55 acres) of road would be decommissioned. Road decommissioning would directly improve soil conditions by decompacting soils and adding coarse woody material and other organic matter to the existing road surface. Road decommissioning would also improve slope stability and reduce the potential risk of mass erosion from culvert failure. Decommissioned roads are considered as returned to the productive land base through removal from the transportation system. Soil structure, water infiltration, aeration, root penetrability, and soil biological activity improvements are observed with road decommissioning techniques used on the Nez Perce-Clearwater National Forests (Lloyd et al. 2013). Monitoring has shown decommissioning and storage treatments to be effective at reducing surface erosion and mass failure risk and increasing vegetative ground cover (Foltz et al. 2007, Lloyd et al. 2013). Under Alternative A, no road decommissioning activities would occur. Soils in these areas would remain in an unproductive condition.

Restoration: Approximately 41 acres of grassland restoration is proposed. This grassland area will undergo prescribed burning and will be revegetated with native grasses and forbs. No erosion or DSD is expected.

3.8.6.2 Activities Analyzed in Detail

Commercial harvest and associated temporary road construction and prescribed burning are analyzed in detail, as these activities can contribute to detrimental disturbance calculations, cause erosion, and affect soil productivity.

Commercial Harvest: Alternative B proposes 8,550 acres of commercial harvest within 143 units. Alternative C proposes 8,700 acres in 145 units, and Alternative D proposes 7,530 acres in 130 units. Harvest treatments include regeneration, improvement, and commercial thinning. Both skyline yarding and ground-based skidding systems would be used to remove trees. Activity-generated slash piled along roadsides and in landings would be dispatched via sale of biomass materials, chipping, or burning. Slash within the units would be left in place or treated using prescribed burning, mastication, or machine piling and burning.

Temporary Road Construction: In Alternatives B and C, approximately 36 miles of temporary roads would be constructed. Of these miles, 8.7 miles would be located on existing road templates. Alternative D proposes 18 miles of temporary roads, of which 8.7 miles already exist. Disturbed width for temporary roads would average 25 feet. Temporary roads would be located on low-gradient, dry ridges or upper slopes and away from water; these roads would have no stream crossings.

Temporary roads are considered 100% detrimental disturbance with reduced soil productivity until vegetation, organic matter, and hydrologic function are restored. The greater disturbance associated with temporary road construction is the displacement or mixing of the topsoil, including the Mazama ash cap, during road excavation. Temporary roads would be constructed, used, and decommissioned within 1-2 years. Road decommissioning following use would promote restoration of soil structure, water infiltration, aeration, root penetrability, and soil biological activity, as observed with road decommissioning techniques used on the Nez Perce and Clearwater National Forests. These techniques would support recovery of productivity on soils disturbed by temporary roads.

Prescribed Burning: Low- and mixed-severity prescribed fire is proposed on 1,370 acres in 15 units for all action alternatives. Within the proposed units, approximately 465 acres are mapped as LSP and/or susceptible to mass wasting. A design feature of no ignition in these areas (following PACFISH guidelines) would be implemented. Fire would be allowed to back into these areas.

3.8.6.3 Direct and Indirect Effects

The analysis area for direct and indirect effects of the alternatives is the individual treatment units (variable acres) and associated skid trails, landings, and temporary roads within the 43,700-acre project area.

3.8.6.3.1 Alternative A—No Action

This alternative maintains the existing condition. Alternative A would not alter the current soil erosion or landslide potential and would retain the same amount of coarse woody material, both standing and down. Existing DSD would persist with very slight natural recovery of surface layers of compacted soils. Over time, large woody debris from dead trees would fall on the ground, increasing organic matter and water-holding capacities on-site. In the absence of catastrophic fires, these trends would exist on most of the project units.

Risk of large scale, stand replacing fire would increase over time; potentially causing hish soil burn severity and subsequent erosion. The timing, size, or intensity of such an event cannot be predicted.

Under Alternative A, no road decommissioning activities would occur that would directly improve soil conditions by decompacting soils and adding coarse woody material and other organic matter to the existing road surface. Soils in these areas would remain in a less productive condition.

3.8.6.3.2 Alternatives B, C, and D

Landslide and Erosion Hazard Potential

The project area has been mapped and divided into landtypes (areas featuring similar soils, hydrology, and vegetation characteristics). Soil erosion and mass wasting are natural processes, and many landtypes across the Forest have high inherent hazards of erosion, mass wasting, and landslides (NRCS 2006). These natural processes have occurred over long time periods and are fundamental factors in creating the present-day landscape.

Landslide-prone (LSP) areas were identified using GIS analysis and verified in the field. For Alternative B, approximately 307 acres of LSP area are located within 22 units. Alternative C has 315 acres within 23 units, and Alternative D had 173 acres in 15 units. These LSP areas would be further delineated in the field during unit layout and would receive a PACFISH buffer. If additional landslide prone areas are identified, the area would be excluded from harvest and a PACFISH buffer would be added. **No harvest activities would occur in these areas.** Indicators of landslide prone areas include: steep (over 60%) concave slopes; hydrophytic vegetation (i.e. sedges, moist site ferns); slumps, draws, and basins; past landslide locations; and obvious soil movement areas (typically indicated by curved and/or buttressed tree boles, soil creep, tension cracks, etc.).

An erosion hazard assessment based on landtype properties was used to determine erosional characteristics of the project units and temporary roads. This assessment was used to develop project design measures to minimize erosion potential. Mass wasting, surface erosion, and subsurface soil erosion potentials were evaluated for the landtypes coinciding within the proposed harvest and burn units. (See project file for detailed information on individual units.)

Surface erosion was low to moderate for all harvest units. Only 16 acres were located on landtypes rated as high for mass wasting, and these acres were located within the same areas as the LSP areas and would be excluded from harvest activities.Under Alternatives B and C, ground-based logging would occur on approximately 3,080 acres located in areas with high subsurface erosion potential. Under Alternative D, ground-based logging would affect 2,950 acres located in areas with a similar high risk for subsurface erosion. Generally, logging in areas with high risk for subsurface erosion is problematic only if the surface soil is removed and the subsurface and parent material is exposed, such as excavated skid trails and landings. Based on past monitoring on the Clearwater Forest, an estimated average 10% of areas using ground-based logging systems are detrimentally disturbed. Using this assumption, approximately 300 acres would be utilized for skid trails and landings for all action alternatives on areas with high subsurface erosion potential.

Landtype erosion hazards used to assess the effects of the alternatives on soil stability and erosion potentials indicate an overall increase of erosion potential for each of the action alternatives. Surface soil loss through displacement and mixing with infertile substrata has long-lasting consequences for soil productivity. This loss occurs during temporary road construction, excavation of skid trails and landings, and displacement of soils during ground-based harvest. Irreversible damage to soils could result from the loss of the volcanic ash cap. Although soil recovery could still occur in remaining subsurface soils, the exceptionally high porosity and water-holding properties of the Mazama ash cap would likely be irrecoverable. Even though the ash layer is not a significant source of soil nutrient content, loss of the ash layer reduces water-holding capacity and high-quality tree rooting material. Since volcanic ash is not easily replaced, these effects may be very long lasting. Skid trails and landings would be located and designated to minimize the area of soil disturbance.

Design measures to reduce the potential for subsurface erosion include the following: limiting the amount of excavated skid trails and landings; fully decommissioning all excavated skid trails and landings on these landtypes; and placing large, woody material over the contoured slope for soil stabilization.

For Alternatives B and C, approximately 30 miles of proposed temporary roads are located on landtypes with high subsurface erosion potential. Approximately 8.0 miles occur on already existing road templates. For Alternative D, 15 miles of temporary roads (7.5 miles existing) occur on high subsurface erosion landtypes. Location on these landtypes is often only problematic if the surface soil is removed and the subsurface material is exposed. The proposed temporary roads would be located on ridgetops and upper slopes, and only short, discontinuous portions would require some form of excavation. All temporary roads would be decommissioned after use, and large woody material (>3 inches in diameter) would be placed on the surface to aid in soil stability. An increased number of water bars or the addition of slash material to the road bed would be used as necessary to reduce erosion while the road is in use. Even if small segments in these roads cut into the subsurface material and some erosion does occur, the likelihood of sediment delivery to streams would be minimal, because temporary roads would be located on ridgetops far from stream channels.

Low- and mixed-severity prescribed fire is proposed on 1,370 acres for all action alternatives. Green tree mortality within the treated areas would be less than 50%, resulting in a patchy mosaic of burned and unburned areas. Unburned portions of burn units would capture and hold much of any generated erosion. Approximately 465 acres are mapped as LSP and/or susceptible to mass wasting. A design feature of no ignition in these areas (following PACFISH guidelines) would be implemented. Fire would be allowed to back into these areas.

3.8.6.3.3 Soil Productivity

Compaction, displacement, rutting, severe burning, surface erosion, loss of surface organic matter, and soil mass movements can all reduce site productivity. For the purpose of the project, proposed harvest units, temporary roads, and prescribed burn units are all considered Activity Areas.

Much research has been conducted on the extent of ground disturbance from harvest activities. Disturbance has been shown to range from 4% to over 40%, depending on equipment used, method, and season of operation, and silvicultural prescription (Clayton 1981; Clayton 1990; McNeeland Ballard 1992; Tepp 2002). Megahan (1980) documented that the highest amount of disturbance came from tractor yarding, with lesser amounts from skyline and aerial methods. In order to estimate the potential increase in detrimental disturbance created by proposed activities, the following assumptions were made for ground-based skidding, skyline yarding, temporary road construction, and slash treatment:

- Detrimental soil impacts from proposed ground-based skidding are estimated at 8%–12% (average 10%) of an Activity Area based on use of designated skid trails (Archer 2008). Detrimental soil disturbance is generally limited to main skid trails and landings. Soil disturbance can be minimized by using existing skid trails and/or by designating the locations of new skid trails (Froehlich and Adams 1984; Froehlich and McNabb 1983).
- Estimated detrimental soil impacts from proposed skyline yarding are 4% of an Activity Area, and disturbance is mostly concentrated at landings.
- Impacts to soil from temporary road construction are expected to span an average width of 25 feet wherever roads are built. This estimate is based on the assumption of a running road surface 12–15 feet wide and an additional 3–6 feet, cleared of vegetation, on each side of the road, where the soil would likely be displaced and the organic litter layer disturbed and/or removed. Based on these estimates, temporary roads would increase DSD by less than 3% for any activity unit. .Alternatives B and C propose 36 miles (8.7 existing) of temporary road. Alternative D proposes half as much temporary road with 18 miles (8.7 existing). An altered logging system design was developed for Alternative D due to the reduced access. This added an additional 2.0 miles (3 acres) of swing trail or skid trail construction. These would have essentially the same effects as temporary roads, due to the extent of soil disturbance.
- Activity-generated slash piled along roadsides and in landings would be dispatched via sale of biomass materials, chipping, or burning. Activity generated slash would be machine-piled and burned on slopes less than 35% where needed to increase survival of leave-trees. Machinery would utilize existing trails for piling operations. On steeper ground, broadcast and jackpot

burning would be used for fuels reduction and site preparation. Treatment of slash is incorporated in the estimated DSD discussed above.

The calculations based on the above assumptions are gross estimations and are best used to compare alternatives and develop design criteria for units that may have particular concern. Based on the above DSD assumptions, the proposed activities could cause soil disturbance on approximately 521 acres for Alternative B, 541 acres for Alternative C, or 505 acres for Alternative D, with the estimated increase of DSD in the harvest units ranging between 4% and 21% (see project file). The estimated increase includes skid trails, landings, and temporary roads that would be obliterated after project activities, so some measure of improvement would occur on those areas. The area of increased DSD is approximately 1% of the 43,731 acre project area for all action alternatives. The highest percent increase in soil disturbance occurs in units with proposed ground-based yarding methods. Some of these units have existing skid trails and landings that could be reused, thus minimizing the amount of new detrimental disturbance.

Implementation of project design measures and BMPs would minimize DSD, and the decommissioning of skid trails, landings, and temporary roads would further improve soil condition. Decommissioning activities include decompaction, recontouring, adding organic matter, and seeding/planting. Soil remediation improves water infiltration, reduces potential for weed invasion, stabilizes slopes, and improves tree growth and vegetation establishment.

About half of the units are below Forest standards for down large woody material due to excessive slash management after previous harvest activities. Units 107, 117, 142, and 148 (past partial cut units proposed for regeneration harvest), units 201–206, 208–212, 214–216, 220–222, 225–227, 233, 236, 304–306, 309, 310, 315–320, 322–324, 330–332, 343–351, 354, 356, 358, and 373 (past clear-cut actions now proposed for commercial thin), and units 501 and 506 (past partial cuts proposed for improvement harvests) are lacking coarse woody material (<5 tons/acre). Units 209, 212, 213, 350, and 373 have thin litter/duff layers of <2 centimeters.

Commercial thin units would retain 40%–50% of their trees (or more), providing existing and future coarse woody material, which would maintain soil stability and productivity. For regeneration and improvement units, 14–28 standing trees per acre (tpa) would be retained as individuals or in groups. In addition, 7–33 tons/acre (depending on habitat type and aspect) of down woody material would be left in the interior of each unit. Units 107, 117, 142, and 148 would have tree retention levels on the high end of the range to account for the lack of existing down woody material. By adhering to these design elements, the action alternatives would meet Regional soil standards for organic material by adhering to these design elements.

Prescribed fire can remove organic matter from the soil or change the physical and chemical properties of soil if temperatures become too high, as in a severe burn. Underburning drier, open stands using quick, light-severity burns that burn only top layers of duff would have minimal impacts on soils. Areas of mixed conifers where the objective is to create openings may experience more high-intensity fire, but not necessarily high-severity burns. High-severity fires can create water-repellent soils, which may result in soil erosion via mass wasting, sheet erosion, and/or gully erosion events. Mapping of local wildfires and ongoing monitoring of past prescribed burns indicate that approximately 4%–10% of the burn units would burn severely. This would be considered DSD, but the amount would meet Regional soil standards.

3.8.6.3.4 Effectiveness of Design Criteria

Past monitoring and research indicate that the effectiveness of the project design features would be moderate to high (Froehlich and McNabb 1983; Graham et al. 1994; Graham et al. 1999; Korb et al. 2004; Neary et al. 2008; Curran et al. 2005a,b).

3.8.6.4 Cumulative Effects

For the purpose of the project, proposed harvest units and associated temporary roads and prescribed burn units are considered Activity Areas. The cumulative effects areas are the same as those discussed in the section addressing direct and indirect effects.

Areas affected by DSD can take several decades to recover, depending on soil texture, depth of compaction, and loss of organic material (Powers et al. 2005; Froehlich et al. 1983). This analysis considers all activities from the 1950s to the present, as well as 20–50 years into the future.

Conditions in the project area are a result of both natural processes and human activities. Past management activities include permitted grazing (1960s to present), recreation, fire suppression, road building and maintenance, and previous harvest activities (1950s to 2005). Past harvest and associated road construction have caused the most impact to the soil resource. Soil disturbance from these activities was incorporated into the DSD calculations.

3.8.6.4.1 Timber Harvest

Harvesting methods prior to the 1990s often consisted of hand felling trees, unrestricted tractor skidding and extensive machine piling of slash. Ground-based logging occurred on slopes exceeding 35% and dense networks of excavated roads and skid trails were commonly constructed. These practices frequently resulted in extensive compaction, rutting, and areas of scraped or displaced topsoil and organic matter. Machine piling of slash often removed small organic material, large coarse wood, and topsoil. Forest practices have changed over the last few decades. Project design measures, BMPs, and Forest Plan guidelines have been developed in order to reduce the extent of disturbance and maintain soil productivity. Designated skid trails, retention of woody material, operating under dry conditions, and limiting ground-based skidding activities to slopes less than 35% are now common practices. Slash treatment techniques have changed from dozer piling to excavator piling along designated trails, so that less soil displacement and compaction occurs, reducing the detrimental effects to soil.

Since the 1950s, 28% of the project area has been harvested. Most harvest activities occurred between the 1960s and 1990s, with approximately 2,500 acres of intermediate harvest and 9,500 acres of regeneration harvest. The most notable effects from harvest activities were compaction, displacement, and burned areas at landings. In steeper units, impacts were more dispersed. Less steep units had linear disturbance, mostly in the form of compacted skid trails and landings.

3.8.6.4.2 Fire

Approximately 19,490 acres (45% of the project area) have burned in the project area since 1870. Evidence of past wildfire was noted in many of the units during soil surveys. No impacts from fire suppression activities were observed.

3.8.6.4.3 Roads

Roads also influence soil, with long-term to permanent impairment of soil productivity. Although system roads are excluded in the determination of whether projects meet Forest Plan and Regional standards, these roads are a part of the existing condition. Within the project area, approximately 180 miles or 1,100 acres of system roads occur where topsoil and subsoil have been displaced, mixed, or lost to erosion. This acreage represents about 3% of the project area. Since 1997, over 30 miles of roads have been decommissioned. The project proposes to decommission 13.2 miles of system roads. An additional 65 miles of nonsystem roads would be decommissioned under the Clear Ridge Road Decommissioning Project, which is currently under development.

3.8.6.4.4 Grazing

Effects from grazing are moderate and tend to be highest near meadow areas, seeps, and springs. Impacts within the units are transitory (in the form of livestock trails) and are mostly on the edges of units or along old skid roads. Grazing impacts accounted for less than 1% of soil detrimental disturbance in the units.

3.8.6.4.5 Recreation

Recreation activities that were noted during field surveys include dispersed camping, off-highway vehicles (OHVs) and full-size vehicle use, fuelwood cutting, and hunting. Dispersed camping is generally located on already disturbed sites along system roads. Effects from recreation activities are primarily associated with full-size vehicles and OHVs using system roads during wet conditions, creating wheel ruts that concentrate water flow. Disturbance from recreation activities within harvest and burn units is anticipated to be negligible (less than 1%).

Ongoing and foreseeable actions within the proposed Activity Areas (harvest and burn units) consist of grazing, recreation, and fire suppression. Grazing impacts could increase over a period of up to 10–20 years after harvest when more forage is available in the harvest units. This is not expected to account for increased disturbance as livestock would trail along already disturbed skid trails and temporary roads that have been seeded. Recreation activities are not expected to increase in the harvest units, so an increase in detrimental disturbance is not expected. Fuelwood cutting could increase after project activities, but many of the units are located along closed roads and access is limited. Fire suppression activities could increase DSD but the timing and extent of such disturbances cannot be predicted.

3.8.6.4.6 Alternative A—No Action

This alternative maintains the existing condition. It would not alter the current soil erosion or landslide potential and would retain the same amount of coarse woody material, both standing and down. Existing DSD would persist with very slight natural recovery of surface layers of compacted soils.

3.8.6.4.7 Alternatives B, C, and D

The cumulative effects of these Action Alternatives were based on the estimated potential of increased detrimental disturbance (based on Region 1 Supplement definitions) when added to existing disturbance and to evaluate whether the project met Regional and Forest Plan standards.

The cumulative effect of past and proposed activities was determined by adding the estimated disturbance from the project (increase of 4%–21%) to the existing DSD (0%–22%). Potential cumulative DSD within the harvest units is estimated to be between 7% and 40% prior to implementation of project design measures. (See project file for detailed information on individual units.)

As shown in Table 3-17, 75 to 78 units would require implementation of unit-specific design measures in order to meet Regional soil standards. These measures would limit the amount of increased DSD from project activities and reduce the amount of existing detrimental disturbance by obliterating existing skid trails and landings. The project would meet the Regional soil standards by limiting the extent of detrimental disturbance to <15% following project implementation or by trending positive for those units with DSD currently >15%.

Table 3-17. Unit-Specific Design Measures to Meet Regional Soil Standards

Design Category	Design Measures	Units	Alternative B	Alternative C	Alternative D
Reuse	Units that would exceed 15% without the reuse of existing templates	101, 104, 123, 133, 201, 204, 206, 211, 213, 215, 216, 221, 222, 228, 232, 235, 238, 307, 316, 323, 330, 331, 332, 337, 340, 347, 349, 352, 356, 501	30	31[a]	31[a]
Special	Units that would exceed the 15% standard—limited new disturbance to meet standard	134, 135, 147, 202, 203, 205, 208, 217, 220, 225, 229, 233, 236, 305, 306, 309, 315, 317, 335, 341, 343, 348, 351, 357, 373	25	25	22[b]
Trending Positive	Units that are currently over the 15% standard	202, 205, 209, 210, 212, 214, 219, 230, 231, 234, 237, 301, 304, 318, 319, 320, 333, 344, 345, 350, 354, 358	19	19	19
Forest Plan Amendment	Units that are over the 20% Forest Plan Standard	304, 320, 344	3	3	3
Number of Units with special design features/mitigations			77	78	75
Number of Proposed Harvest Units			143	145	130

[a]Unit 329 added to Alternatives C and D

[b]Units 203, 343, and 351 dropped from Alternative D

3.8.6.4.8 Reuse, Trending Positive, and Forest Plan Amendment Design Categories

Methods include the following: a logging system layout design would be developed to use as many of the existing skid trails and landings as possible to limit the amount of new detrimental disturbance; all skid trails and landings would be decommissioned after use; and equipment used for machine piling or mastication of activity slash would remain on designated skid trails or would necessitate rehabilitation (decompaction or recontouring) of any detrimental disturbance created by its off-trail activity.

3.8.6.4.9 Special design category

Special attention is needed for these units to remain at or below 15% DSD following project implementation. Methods to meet or ensure this goal may include the following: main skid trails would be located only on existing disturbed areas with minimal, one-pass trails occurring on undisturbed ground; cut-to-length forwarder systems would be used; equipment used for machine piling or mastication of activity slash would remain on designated skid trails; and logging system layout designs would limit the amount of new detrimental disturbance (portions of the unit would be dropped if the layout plan cannot reach the entire unit while staying under the 15% standard). The estimated number of acres of new disturbance has been calculated for each unit and can be found in the project file. In addition, all skid trails, landings, and temporary roads would be decommissioned.

Decommissioning of skid trails and landings would directly improve soil conditions, processes, and functions in the units by decompacting soils and adding coarse woody material and other organic matter to the existing skid trails or road surfaces. Decompaction of soil would break up platy structure, increase water infiltration rates, and temporarily remove vegetation. Seed would be spread over disturbed ground to re-establish vegetative cover. Where available, duff and woody material would also be spread over the disturbed area to increase the recovery rate.

Skid trail decommissioning following harvest would utilize methods similar to Forest road decommissioning methods. Improvements in soil structure, water infiltration, aeration, root penetrability, and soil biological activity have been observed on the Clearwater National Forest after road decommissioning techniques were used there. A local soil study (Lloyd et al. 2013) observed that improved infiltration rates and soil bulk densities on decommissioned roads recover to values similar to never-roaded areas at 1, 5, and 10 years following decommissioning. In this same study and time frame, soil organic matter, total carbon, and nitrogen pools and processes increased to levels similar to those found in never-roaded surfaces. The Clearwater Forest Plan Monitoring Report (USDA Forest Service 2009b) stated that road decommissioning monitoring on the Forest across a wide range of sites has documented an increase in vegetative cover from 18% the year after decommissioning to 64% at 10 years after decommissioning. Skid trail and road decommissioning following reuse would also improve slope stability and decrease long-term erosion. Soil improvement activities on existing disturbed areas are expected to accelerate soil recovery and result in immediate or near-term (approximately 1–5 years) improvement in fundamental soil properties (e.g., bulk density, infiltration rates, soil organic matter, carbon, and nitrogen). These improvement activities would also provide support for continued long-term recovery of soil functions and productivity.

3.8.6.5 Irreversible and Irretrievable Commitment of Resources

Loss of the volcanic ash–influenced loess through erosion or removal (excavated temporary roads and skid trails) is irretrievable. Remaining soil materials would eventually develop (over a minimum of several decades) but may lack the water- and nutrient-holding properties of volcanic ash.

Small, localized areas would have reduced soil productivity until vegetation becomes reestablished and organic layers rebuild. These areas include temporary roads, skid trails, landings, and burned areas. Severely burned areas and areas with deep compaction could take decades to recover (Froehlich et al. 1983). Soil improvement activities such as decompacting soils and adding organic matter (woody material) could jump-start this process (Curran et al. 2005a,b).

All project activities include BMPs, design features, or rehabilitative measures to avoid irreversible and irretrievable commitment of resources on the productive land base. Decommissioning of temporary roads and skid trails, which includes recontouring and recovery of excavated ash cap topsoil, is expected to initiate recovery of soil productivity functions over time, which could be as long as 40–60 years. Additional design measures such as keeping disturbance to less than 15% areal extent, re-use of existing skid trails in units, decompaction of skid trails and landings, and retention of woody debris are intended to avoid loss of the ash cap soil.

3.9 VEGETATION

This section summarizes the effects of the alternatives on vegetation. This section was summarized from the “Clear Creek Restoration Project Vegetation Report,” located in the project file.

Historically, the primary change agent within the Clear Creek drainage was a mixed-severity fire regime with return intervals ranging from 75 years to over 300 years. Insects, disease, and humans have become the primary agents of change since fire has been absent from the area.

Historic logging practices generally created small patches with regular edges that are inconsistent with natural change agents. The project is designed to utilize existing small patches of young trees to create larger patches of young trees by implementing variable retention regeneration methods, thinning through younger stands, and retaining 100% of stands in some areas. All of these activities would occur within the Focus areas. These activities were designed to create a disturbance pattern that is more in line with the size and scale of what historically would have been a mixed-severity fire regime. The location of the Focus areas was intended to utilize the existing young forest and the existing transportation system.

The goals of the project are designed to promote forest health by maintaining and reestablishing long-lived, early seral species such as white pine, ponderosa pine, and western larch, which have declined significantly over the last 80 years due to white pine blister rust and lack of disturbance (Arno and Keane 2002; Keane and Arno 1996). Healthy forests with ecological resilience will help provide and sustain a broad range of ecosystem services including fire/fuels, wildlife, recreation, aquatics, and commodity production. Healthy, resilient landscapes have a greater capacity to survive natural disturbances and large-scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing demand for human use.

3.9.1 Analysis Area

The analysis area for this assessment includes only the 43,731 acres of NFS managed lands, all of which lie within the upper two-thirds of the drainage. The analysis area is ecologically and socially important for many reasons, including fish and wildlife habitat, opportunities for sustained local economic stability, protection of Nez Perce tribal treaty rights, and recreation opportunities.

The analysis indicators discuss the existing conditions at treatment unit and analysis area scales. However, the existing conditions of the biophysical environment also need to be discussed at the larger spatial scale of the Middle Fork Clearwater River basin, and sometimes northern Idaho or the northwestern United States, to provide appropriate context for analyzing Clear Creek conditions. Agents of change—such as succession, weather, climate, fire, insects, and disease—must also be considered in these discussions.

3.9.2 Regulatory Framework

Forest Plan direction and all federal and State laws and regulations pertaining to the management of vegetative resources on the Forest would be applied to the project, including the NFMA of 1976. In addition, diagnosis, prescription development, and forest health analysis are guided by Forest Service regulations and policy (FSH 1909.60 and 2409.17; FSM 1920, 2020, 2470, 2471, and 2472) and the Region 1 Integrated Restoration and Protection Strategy.

3.9.2.1 Nez Perce Forest Plan

3.9.2.1.1 Timber Standards

Timber Standard 1

Require silvicultural examination and prescriptions before any vegetative manipulation takes place on forested lands. Final determination of the silvicultural system for areas to be harvested will be made by a certified silviculturist after an on-the-ground, site-specific analysis.

All proposed treatment stands have had stand exams or have been examined on the ground by a silviculturist, wildlife biologist, and fuels specialist. All vegetative treatments will have silvicultural prescriptions approved by a certified silviculturist prior to treatment implementation. Prescriptions will consider site-specific factors as well as multiple resource objectives, NEPA decisions, other regulatory requirements and Forest Plan goals, objectives, and standards. Action alternative treatments were proposed because they balance the management, operational, silvical, and human dimension requirements and respond to the purpose and need.

Timber Standard 2

Clear-cutting will not occur adjacent to previously harvested areas that are still considered openings.

No harvest is being proposed adjacent to stands that would be considered an opening. All proposed harvest units that are adjacent to previously harvested stands are certified as fully stocked, and the trees are greater than 10 feet in height.

Timber Standard 3

Permit timber harvest on lands classified as “unsuitable” for timber management to accomplish multiple use objectives.

No harvest is being proposed on unsuitable lands.

3.9.2.1.2 Old Growth Standards

In order to maintain a viable population of old growth dependent species the Nez Perce National Forest plans to manage 10 percent of the total forested acres as old growth with no less than 5 percent of the forested acres maintained as old growth within each prescription watershed or combination of watersheds totaling 5,000-10,000 acres. If less than 5 percent old growth exists in a drainage, the additional required acres will be assigned to adjacent drainages where excess old growth is available or an additional 5 percent of the forested acres within prescription watershed shall be designated as replacement old growth.

Following direction to use best available science the Nez Perce National Forest has updated Forest direction for old growth and snag management. Old Growth Forest Types of the Northern Region by Green, Joy, Sirucek, Hann, Zack and Naumann is the current and best science available for defining old growth. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 is based on habitat types to determine old growth conditions. Greens research is based on field data called stand exams with over 20,000 samples.

Although Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 criteria for old growth is more complex, the criteria is also more relevant, more precise and within the capability of the specific Nez Perce National Forest habitat types. Each habitat type is assigned to a habitat type group which corresponds to an old growth type. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 defines old growth within the ecological conditions with specific criteria that are within the capability of the habitat type. Green et al. 1992, errata corrected 02/05, 12/07, 10/08, 12/11 old growth description is based on successional processes in which stands develop into late seral single storied stands or late seral multi storied stands or the stage where climax tree species dominates the stand.

3.9.2.1.3 Protection Standards

Protection Standard 3

Minimize the impacts of the mountain pine beetle and other insect and disease infestations to the extent necessary to achieve the overall goals and objectives of this Forest Plan.

Loss of the long-lived early seral components in the ecosystem is a major factor in the lack of ecological resiliency. Regeneration treatments would remove dead, dying, and at-risk vegetation, which would trend the project area toward species compositions with increased resilience. Proposed treatments would minimize adverse pest effects and maximize a range of objectives.

3.9.2.2 National Forest Management Act

3.9.2.2.1 Vegetation Manipulation (36 CFR 219.27(b)[1]

"Ensure that technology and knowledge exist to adequately restock lands within 5 years after final harvest."

Restocking within 5 years of regeneration harvest is a required design item of the action alternatives. Technology and knowledge do exist to comply with this requirement. The Clearwater National Forest Plan Monitoring and Evaluation Report for 2008 shows that

60% of stands harvested in 2002 have been certified, and the rest are progressing toward certification. Recent, similar monitoring data is not currently available for the Nez Perce National Forest; however, the project area is close enough to the Clearwater National Forest so that soils, habitat types, and moisture regimes are similar enough so that the Clearwater data can be used as a surrogate. The delay in certification was caused by a delay in achieving proper site preparation. This standard is met under the action alternatives.

3.9.2.2.2 Vegetation Manipulation (36 CFR 219.27(b)[1])

"Be chosen after considering potential effects on residual trees and adjacent stands."

The potential short- and long-term negative effects of proposed activities on adjacent trees were considered during alternative development. Retention areas would be designed to minimize mortality during site preparation activities. Site-specific prescription modifications, such as change unit boundary, would be incorporated into the prescriptions. This standard is met under the action alternatives.

3.9.2.2.3 Silvicultural Practices (36 CFR 219.27(c)

"No timber harvest, other than salvage sales or sales to protect other multiple-use values, shall occur on lands not suitable for timber production."

Guidelines for determining suitability are found in the FSH (2409.13). The proposed harvest units are within the productive habitat types (as described in Cooper et al. 1991). None of the areas being proposed for treatment as part of the project are designated as unsuitable under the 1987 Forest Plan (USDA Forest Service 1987a). This standard is met under the action alternatives.

3.9.2.2.4 Even-aged Management (36 CFR 219.27(d)

"When timber is to be harvested using an even-aged management system, a determination that the system is appropriate to meet the objectives and requirements of the Forest Plan must be made. Where clear-cutting is to be used, it must be determined to be the optimum harvest method."

The action alternatives propose a combination of regeneration harvests (shelterwood establishment with reserves) and prescribed burning. The regeneration harvests are even-aged regeneration harvest systems. All vegetative treatments would have prescriptions prepared by a certified silviculturist. Overall, the analysis area stands display high mortality and low growth rates. All proposed treatments meet objectives and requirements of the Forest Plan.

3.9.2.3 Forest Service Manual 2471—Harvest Cutting

The size of harvest openings created by even-aged silvicultural in the Northern Region will normally be 40 acres or less. Creation of larger openings will require 60-day public review and Regional Forester approval.

The public was informed during scoping that regeneration openings in excess of 40 acres were proposed for the project area. Approval to exceed the 40-acre opening size, with appropriate interdisciplinary analysis and documentation, was received from the

Regional Forester's office on September 13, 2013. The action alternatives would create openings on the landscape that are closer in scale and pattern to the openings developed under historic disturbance regimes for this area. Proposed harvest openings greater than 40 acres are discussed under Patch Size in the direct, indirect, and cumulative effects section. This standard is met under all the action alternatives.

3.9.3 Resource Indicators

No single indicator is a definitive measure of forest health or resilience. A healthy and resilient forest ecosystem is characterized by composition, structure, pattern, and ecological processes sustainable under current and future conditions.

The basis for the forest health analysis is comparison of the existing condition and the outcome of the alternatives to the desired condition in the project area. The desired condition is specific to the project area and was developed by incorporating data from Ecological Units of the Northern Region Subsections, VRUs, the Interior Columbia Basin Ecosystem Ecosystem Management Project, and the Selway and Middle Fork Clearwater Rivers Sub-basin Assessment. Studying historical data can reduce the chances of major future surprises. Forest composition and three characteristics of forest structure are used to assess trends toward or away from health and resilient conditions. Current conditions for these indicators were derived from legacy data Timber Stand Management and Records System (TSMRS) and FSVeg data.

The effectiveness of the alternatives in addressing forest composition objectives is indicated by the following:

- Percent of the project area with **forest cover type** dominated by the long-lived early seral species (western white pine, western larch, and ponderosa pine) compared to area dominated by grand fir and Douglas-fir (*Pseudotusuga menzeseii*).

The effectiveness of the alternatives in addressing forest structure objectives is indicated by the following:

- Percent of the project area in each stand **age class**. Age groups are young (0–40 years), mid-seral (41–100 years), mature (101–149 years), and old (150 years and older). Age class will be analyzed at the project area scale to allow comparison of alternatives and desired conditions at various points in time-based age class distributions by vegetation response units.
- **Vertical structure** is used as a within-stand structural arrangement indicator. It is represented by the number of vertical layers present in a stand. Vertical structure will be compared between alternatives. The 4 vertical structure classes are single-storied, two-storied, three-storied, and continuous vertical structure.

Landscape arrangement is discussed in terms of changes in patch sizes of the age classes. Comparison of current conditions and action alternatives to the desired condition is an indicator of resiliency at the project area scale.

3.9.4 Analysis Methodology

This analysis relies on comparison of existing conditions to desired conditions at various spatial and temporal scales. The DFC was used for comparing the present condition of the project area and anticipated conditions under the No Action alternative and the three action alternatives over time.

The interaction of successional development (as represented by habitat types in Cooper et al. 1991; USDA Forest Service 1997) and disturbances such as fire, insects, diseases, and human influences results in the species composition, structure, and landscape arrangement of an ecosystem. Maps depicting habitat groups and VRUs are available in the project record. Existing conditions reflect past natural disturbances and management activities.

The vegetative desired condition for the project area was developed prior to any proposed action or effects analysis. It is based on multiple resource objectives, using direction from the 1987 Forest Plan (USDA Forest Service 1987a), the proposed 2008 Plan Revision, the Selway Middle Fork Clearwater Sub-basin Assessment, and the draft Clear Creek NFMA document.

3.9.4.1 Data Sources

Current vegetative conditions were summarized using a vegetation inventory model. The model uses forest stand data from FACTS, TSMRS, FSVeg, and the Most Similar Neighbor modeling program (a model that populates estimated stand data to areas without stand exams). The inventory model also uses the Forest Vegetation Simulator (FVS) to grow all the stands to 2012 conditions, starting from the time when the stands last received a stand examination. Additionally, Region 1 Vmap data were used to further evaluate current conditions of the project area. The data were collected in 2006 and classified using the Region 1 Vegetation Council Existing Forested Vegetation Classification System. Inventory work is performed on individual stands. A stand is defined as a contiguous group of trees sufficiently uniform in species composition, arrangement of age classes, and condition on a relatively similar site.

The FVS model provided a variety of information that was used in the analysis, including species composition, growth over time, and fire and fuels parameters. Documentation of these FVS attributes is found in Graham et al. (1994), Dixon (2002), Crookston (1999), Frankel (1998), and McGaughey (2002). Additionally, a patch analysis derived from the Fragstats program was used to describe and compare landscape pattern, arrangement, and patch size. The patch analysis is available in the project record.

3.9.5 Affected Environment

3.9.5.1 Biophysical Environment

Much of the vegetation in the Nez Perce-Clearwater National Forests is a result of the productive ash cap soils and the prevailing climatic pattern. The climate is dominated by Pacific maritime air masses and prevailing westerly winds. Within the analysis area, annual precipitation varies from 40 to 50 inches. Over 90% of the annual precipitation occurs during fall, winter, and spring months as a result of cyclonic storms in the form of a series of frontal systems moving east. The elevation of the analysis area ranges from 2,000 to 6,600 feet.

3.9.5.2 Ecological Settings and Vegetation Response Units

Bailey's ecosections were used to summarize historic vegetation information (McNab and Avers 1994). Each ecosection contains broad vegetation and topographic conditions. Local landtype classifications were used to divide each section into 3 settings, which are roughly similar to the subsections described in Ecological Units of the Northern Region: Subsections (Nesser et al. 1997). A map of potential vegetation types was used to attribute the forest cover types to the settings (Northern Region Cohesive Strategy Team 2002). The primary settings within the analysis area are Idaho Batholith Breaklands, Idaho Batholith Uplands, and Idaho Batholith Subalpine. The Subalpine setting comprises only 160 acres of the project area, and no treatments are proposed for these acres. Therefore, the Subalpine acreage will not be discussed in this analysis.

Incorporated within each of the resulting two settings are 7 VRUs. These units are broad ecological land sections that contain habitat type groups and terrain that have similar patterns of disturbance and successional processes. Patterns of plant community composition, age class structure, and patch size tend to fall within certain ranges for each VRU. The components used to build the VRU classification system are habitat type groups (potential vegetation), landforms, climate, and presettlement disturbance processes (such as fire regimes). The desired conditions, potential natural vegetation that could occupy the project area following a disturbance, and a discussion of successional patterns and development are presented below. The existing conditions for age class groups are also presented to give an idea of where potential land management activities could be used to shift the project area toward desired conditions. Existing conditions are described for the year 2012 and 2017. The year 2017 was included because that is the estimated year when actual vegetative management activities would be implemented. Stands will continue to age through that time, which will result in age class shifts.

3.9.5.2.1 Idaho Batholith—Breaklands

The Breaklands are characterized by low- to mid-elevation canyons on steep south aspects. The Breaklands setting is dominated by steep slopes and deep canyon walls through which the Middle Fork and Clear Creek tributaries flow. Soils are derived from granite, border zone, and basalt geologies. Landslides and surface creep are the dominant erosion processes. The Breaklands are known for having inclusions of LSP areas and shallow soils. These characteristics make this setting more susceptible to erosion and more sensitive to disturbance.

Wildfire was the primary process affecting plant succession, composition, and distribution. Steep terrain favors rapid, upslope spread of wildfires. Stand-replacing fires are more prevalent on long, steep slopes and less frequent in adjoining moist habitats. Patches on dry aspects are uneven-aged, resulting from nonlethal to mixed-severity wildfire. Patches on moist aspects are even-aged, with uniform vegetation and fuel conditions resulting from stand-replacing fires. Early seral species (shrubs, forbs, and grasses), Douglas-fir, ponderosa pine, and grand fir readily reestablish following wildfire episodes.

VRU 3: 3,030 acres (7% of the analysis area)

Desired Condition: Open stands of large ponderosa pine and Douglas-fir dominate upland habitats. Approximately 40%–60% of the landscape contains 10–25 tpa of ponderosa pine and Douglas-fir older than 150 years. Mixed-severity disturbance occurs on about 10%–15% of the analysis area in any 2-decade period. Low-severity disturbances occur on up to 50% of the landscape in a decade. Old forests occur both as isolated or open-understory, large ponderosa pine and Douglas-fir (uplands) and mixed to coniferous forest (shaded or moist habitats).

The desired and existing conditions for patch size, successional stage distribution, and tree size class for VRU 3 are shown in Table 3-18.

Table 3-18. Desired and Existing Conditions for Patch Size, Successional Stage Distribution, and Tree Size Class for Vegetative Response Unit (VRU) 3

Factor	Desired Conditions	Existing Conditions
Patch size	50–200 acres	6–183 acres 38% within size range
Successional Stage Distribution (%)		
Young	15%–25%	6%
Mid-seral	15%–35%	66%
Mature	10%–30%	13%
Old-forest	20%–50%	4%
No data/no survey	—	11%
Tree Size Class		
Non-forest	5%–20%	6%
<5 inches dbh	5%–30%	32%
5–8.9 inches	10%–20%	10%
9–21 inches	20%–40%	15%
21+ inches	20%–40%	8%
No data/no survey	—	28% (in roadless area)

The greatest departures from desired conditions in VRU 3 are the need for increases in both young- and old-forest successional stages. The action alternatives would use regeneration harvest to increase the young age class through management of the mid-seral stage, which exceeds the desired high condition by almost 1,000 acres. Commercial thinning or full retention would be used to promote healthy stands that could grow into the late- and old-forest stages. Patch sizes are on the low end of desired ranges. Proposed regeneration harvest and burning activities would increase patch sizes to better emulate natural disturbance patterns.

VRU 8: 11,350 acres (26% of the analysis area)

Desired Condition: Grand fir, Douglas-fir, and western redcedar dominate stands during late successional stages. Early seral stages range from relatively open to densely stocked and are usually dominated by a mix of early seral and mid-seral species, including lodgepole pine, western larch, and western white pine. Ponderosa pine, Engelmann spruce, and Pacific yew may be present. Important elements include coastal disjunct plant species, early to seral tall shrub and hardwood communities, and old-growth inclusions of western redcedar riparian habitats. Patch sizes are widely variable and result from irregular, infrequent mixed-severity fires and very infrequent stand-replacing fires throughout the landscape. Old-forest habitats dominated by shade-tolerant conifers typically occur in patches of <40 acres and are associated with topographic inclusions (benches, basins, flat ridges, and moist habitats). These smaller patches are a result of stand-replacing fires. About 50%–60% of stands originate from stand-replacing fires. Postdisturbance stands include at least 10 live tpa that are >150 years old. Relict Douglas-fir, western larch, grand fir, and ponderosa pine are common on ridges.

The desired and existing conditions for patch size, successional stage distribution, and tree size class for VRU 8 are shown in Table 3-19.

Table 3-19. Desired and Existing Conditions for Patch Size, Successional Stage Distribution, and Tree Size Class for Vegetative Response Unit (VRU) 8

Factor	Desired Conditions	Existing Conditions
Patch size	300–1,500 acres	8–282 acres 0% within size range
Successional Stage Distribution (%)		
Young	15%–25%	9%
Mid-seral	20%–40%	43%
Mature	15%–35%	22%
Old-forest	10%–40%	23%
Private	—	2%
Tree Size Class		
Non-forest	5%–20%	5%
<5 inches dbh	5%–30%	15%
5–8.9 inches	10%–20%	4%
9–21 inches	20%–40%	34%
21+ inches	20%–40%	36% old
No data/no survey	—	6%

The greatest departure from desired conditions in VRU 8 is the need for an increase in young forest. The proposed action alternatives would use regeneration harvest and prescribed fire to reduce the mid-seral stage and increase patch size.

VRU 12: 40 acres (<1% of the analysis area)

Desired Condition: Bluebunch wheatgrass and Idaho fescue dominate dry upland habitats; shrubs dominate draws and moist inclusions. Patch sizes are limited by aspect and coniferous vegetation. Invasive forbs and grasses are reduced or eliminated. Very frequent (5- to 20-year intervals), low-severity fire maintains open grasslands and rejuvenates shrub habitats. Ponderosa pine and an occasional Douglas-fir occur incidentally. This VRU is incidental at the analysis scale because the unit comprises only 40 acres within the analysis area. All 40 acres are proposed for grassland restoration activities.

3.9.5.2.2 Idaho Batholith—Uplands

The Uplands setting is a mix of gentle-to-steep slopes that form shallow canyons. Surface soils are derived from granite, border zone, and basalt geologies. The warm, moist climate, in combination with deep volcanic ash soils, creates high site productivity for forested stands. Surface creep is the dominant erosion process; mass-wasted areas are local and uncommon.

Fire was the primary landscape disturbance process affecting plant succession, composition, and distribution. The fire regime is variable due to irregular terrain that discourages rapid fire spread. This fire regime creates a mosaic of mixed- to lethal-burned uplands and nonlethal or unburned riparian habitats. Small openings created by the more frequent low- and mixed-severity fires result in a mix of tree species and ages. Stand-replacing wildfire occurs at intervals of 150–250 years or more (Kapler-Smith and Fischer 1997) and is likely associated with strong wind episodes in combination with extended drought.

VRU 7: 2,570 acres (6% of the analysis area)

Desired Condition: Stands are often dominated by mixed occurrences of grand fir, Douglas-fir, Pacific yew, western larch, Engelmann spruce, and lodgepole pine. Western white pine may be present. The decline in white pine has led to the increase of grand fir and Douglas-fir, which have a high susceptibility to root diseases. Pacific yew and moist old-growth are important elements. About 20%–40% of stands originate from mixed-severity disturbances, and 60%–80% originate from stand-replacing disturbances. Post-disturbance stands include at least 10 live tpa that are >150 years old. Two or more age classes are common in any given stand.

The desired and existing conditions for patch size, successional stage distribution, and tree size class for VRU 7 are shown in Table 3-20.

Table 3-20. Desired and Existing Conditions for Patch Size, Successional Stage Distribution, and Tree Size Class for Vegetative Response Unit (VRU) 7

Factor	Desired Conditions	Existing Conditions
Patch size	40–300 acres	1–282 acres 20% within size range
Successional Stage Distribution		
Young Mid-seral Mature Old-forest Private	10%–20% 15%–35% 10%–30% 35%–65% --	26% 25% 28% 20% 2%
Tree size class		
Non-forest <5 inches dbh 5–8.9 inches 9–21 inches 21+ inches	1%–10% 5%–20% 10%–25% 25%–35% 35%–45%	2% 27% 10% 16% 46%

The greatest departure from desired conditions in VRU 7 is the need for an increase in old forests. The young-forest stage is in excess of the desired high condition by 150 acres. The action alternatives would use regeneration harvest to create young forests and would implement commercial and precommercial thinning to promote healthy stands (by selecting for preferred, long-lived species and reducing stand densities to reduce competition for light, water, and nutrients). Thinning would help the stands progress toward the older age classes.

VRU 10: 5,170 acres (12% of the analysis area)

Desired Condition: Open-canopied, multi-aged old-forest stands of grand fir, Engelmann spruce, subalpine fir, western redcedar, and Sitka alder are the dominant cover types. Isolated Douglas-fir, western larch, lodgepole pine, and Pacific yew locally occur on ridges. Mixed alder, forbs, and grasses are well distributed and persistent as inclusions. Multi-aged, mixed-species stands originate from low- and mixed-severity disturbances, including windthrow. Old-forest habitats are dominated by shade-tolerant conifers associated with moist habitats.

The desired and existing conditions for patch size, successional stage distribution, and tree size class for VRU 10 are shown in Table 3-21.

Table 3-21. Desired and Existing Conditions for Patch Size, Successional Stage Distribution, and Tree Size Class for Vegetative Response Unit (VRU) 10

Factor	Desired Conditions	Existing Conditions
Patch size	40–800 acres	5–282 acres 24% within size range
Successional Stage Distribution		
Young Mid-seral Mature Old-forest	10%–20% 10%–30% 10%–30% 35%–65%	9% 18% 15% 58%
Tree Size Class		
Non-forest <5 inches dbh 5–8.9 inches 9–21 inches 21+ inches Unknown/no survey data	1%–10% 5%–20% 10%–25% 25%–35% 35%–45% —	0.1% 10% 0.1% 38% 40% 12%

The greatest departure from desired conditions in VRU 10 is the need for a slight increase in the young forest. Old forest occurs near the top end of desired condition. As expected, mortality from insects, disease, and old age is becoming more evident in these stands as they mature. Proposed regeneration harvest would be used to reduce the old-forest component while increasing the young forest. Proposed commercial thinning in the mid-seral forests would promote healthy, vigorously growing stands.

VRU 17: 20,485 acres (47% of the analysis area)

Desired Condition: Western redcedar and grand fir are the dominant mature forest cover types in the absence of disturbance. With stand reinitiation, Douglas-fir, western white pine, and western larch occur as isolated relics in mature and old stands. The decline in white pine has led to the increase of grand fir and Douglas-fir, which have a high susceptibility to root diseases. Open-canopied, multi-aged old forest and tall shrub communities are important elements. About 40%–60% of stands evolve with mixed-severity disturbances, and 40%–60% develop following stand-replacing disturbances. Post disturbance stands include at least 10 live tpa that are >150 years old. Old-forest habitats are dominated by shade-tolerant western redcedar and grand fir.

The desired and existing conditions for patch size, successional stage distribution, and tree size class for VRU 17 are shown in Table 3-22.

Table 3-22. Desired and Existing Conditions for Patch Size, Successional Stage Distribution, and Tree Size Class for Vegetative Response Unit (VRU) 17

Factor	Desired Conditions	Existing Conditions
Patch size	300–1,000 acres	2–270 acres 0.4% within size range
Successional Stage Distribution		
Young Mid-seral Mature Old-forest	10%–20% 15%–35% 10%–30% 25%–55%	20% 33% 14% 32%
Tree Size Class		
Non-forest <5 inches dbh 5–8.9 inches 9–21 inches 21+ inches Unknown/ no survey data	1%–10% 5%–20% 10%–25% 25%–35% 35%–45% —	3% 20% 9% 20% 43% 6%

No departures from desired conditions occur in VRU 17; however, young forest would decline toward low desired conditions by 2017. Proposed precommercial thinning in young forest and commercial thinning in mid-seral forests would promote healthy stands as they continue to grow into the late- and old-forest stages. Regeneration harvest would be used to increase patch sizes to more natural levels and to maintain desired levels within 5 years.

3.9.5.3 Vegetative Agents of Change

Vegetation is a fundamental part of terrestrial ecosystems. The vegetation that exists across an ecosystem and through time is a function of the physical state, the climate, the plant species available in an area, the disturbance history of the site, and the successional processes that follow disturbance. Most landscapes are a mosaic reflecting the interaction between disturbance and plant succession. The interaction between disturbance forces and successional processes is a keystone process shaping the landscape vegetation mosaic (Zack and Morgan 1994). Understanding disturbance and succession and how they relate to forest composition is necessary to understand the current vegetative state. Additionally, timber harvest has created disturbances to successional patterns.

3.9.5.3.1 Weather

While fires can create dramatic changes to successional development and the ecosystem, weather continually modifies the ecosystem. Moisture and temperature are important to characterize the biophysical environment. Weather disturbances (such as wind events, periods of high moisture, or drought) adjust species composition, structure (at the fine and coarse scale), and function (growth; conditions conducive for insect, disease, or fire mortality) consistently throughout successional development. Weather is not predictable in terms of ecological timing or landscape arrangement, but it has continual and important influence. Examples of weather-related influences include changes in composition and structure due to an ice/wind storm, extended drought creating conditions conducive to bark beetle infestation (mountain pine beetle currently occurring at higher elevations), and the survival of regeneration based on occurrence of a series of moist or droughty years. As discussions move from weather (atmospheric conditions over a short period of time) to climate (how the atmosphere behaves over long periods of time), the continual effects of moisture, temperature, and weather disturbances define the environment and therefore the compositions, structures, and function of the ecosystem.

3.9.5.3.2 Climate Change

Climate change and management of natural resources with a changing climate are both science and social issues. Managing in the face of climate change is a common forest management question, both in terms of the effect climate change will have on the managed ecosystem and the effect the Proposed Action may have on the climate.

The Forest Service has been involved in climate change research for about 2 decades and has a century of science and management experience. The Forest Service has stated its objective regarding climate change as follows:

> The aim is to reestablish and retain ecological resilience of NFS lands and associated resources to achieve sustainable management and provide a broad range of ecosystem services. Healthy, resilient landscapes will have greater capacity to survive natural disturbances and large scale threats to sustainability, especially under changing and uncertain future environmental conditions, such as those driven by climate change and increasing human uses (FSM 2020.2).

The future of forest management in a changing climate is best addressed with approaches that embrace strategic flexibility, characterized by risk-taking, the capacity to reassess conditions frequently, and willingness to change course as conditions change (Hobbs et al. 2006 *[cited in Millar et al. 2007]*). The appropriate approach is an integrated strategy involving a scientific and social climate change approach that considers predictions/scenarios specific to the local ecosystem as well as analysis of specific ecosystem responses. The Washington Climate Change Impacts Assessmentis the most recent and area-specific tool available to understand potential changes in northern Idaho. Until more scientific details for this approach are available, a conservative forest management approach is reasonable; a conservative approach is based on diversity and resilience and can be adjusted in the short, middle, and long terms (adaptive management). This is the basis for proposed treatments in the Clear Creek project area.

3.9.5.3.3 Fire

While forests can be disturbed by weather, insects, and microorganisms, all of these interact with fire. Fire can release a large amount of energy in short periods of time, which is why fire is one of nature's most powerful disturbance forces. During summer, the Clear Creek watershed experiences significant dry periods when vegetation can sustain fires. Lightning was probably the primary ignition source prior to Euro-American settlement. Lightning and human causes are the present-day ignition sources. Fire suppression was considered to be effective at the landscape scale in the 1930s. Understanding fire as an agent of change allows understanding of the functional interactions in a healthy, sustainable ecosystem.

Understanding past fire disturbance or vegetation scenarios for an area allows increased understanding of the area's resilience and sustainability.

Data from the predominant VRUs within the project area (VRUs 8 and 17), combined with the analysis done for the Clear Creek watershed assessments, indicate that only the lethal, very infrequent (151 to 300-year interval) fire regime is still operating. The nonlethal underburning fire regime no longer occurs, due to fire suppression efforts. Fires that start under underburning conditions are usually extinguished at <1 acre in size. The mid-seral successional stages are, therefore, denser and more uniform over the landscape than those that would have occurred historically. For a more detailed discussion of fire ecology, refer to the fire/fuels specialist report.

Fire Severity

- Nonlethal fires – fires that kill 10% or less of the dominant tree canopy. A much larger percentage of small, understory trees, shrubs, and forbs may be burned back to the ground lines.
- Mixed-severity fires – fires that kill more than 10% but less than 90% of the dominant tree canopy. These fires are commonly patch, irregular burns, producing a mosaic of different burn severities.
- Lethal fires – fires that kill 90% or more of the dominant tree canopy. These are often called stand-replacing fires, and they often burn with high severity. They are commonly crown fires.

3.9.5.3.4 Insects and Disease

In the absence of fire, forest insects and diseases can accelerate or reset forest succession by affecting tree species, size, and stand density. Functions of pathogens and insects in forests can be divided into 2 parts: the action, such as killing trees, decaying heartwood, or reducing growth; and the outcome, such as changing species composition of stands or changing stand structure from a mature, closed canopy to a pole-size, low-density structure (USDA Forest Service 2000). Based on summarized species composition, tree diameters, and age classes from Vmap and FSVeg, approximately 76% of the project area may currently be susceptible to insect and disease activity. This level of susceptibility is important because over the last 75 years, insects and disease have replaced fire as the most prominent agent of change.

Root Diseases

Historically, root diseases were a significant factor in reducing subalpine fir and grand fir, which tended to outcompete western larch and, on some sites, white pine. Grand fir regenerated readily in the early stages of stand development but dropped out as a significant component due to high rates of mortality caused by root disease (Byler and Zimmer-Grove 1990). White pine and larch have a higher level of resistance to root diseases at this stage of stand development and were able to capitalize on the increased availability of growing space. Fire exclusion and the loss of these species through logging, blister rust, and mountain pine beetle have reduced the opportunity for early seral species to become established in root disease areas (Harvey et al. 2008).

Insects

Major insect change agents of the Clear Creek watershed include mountain pine beetle, Douglas-fir beetle, Douglas-fir tussock moth, and fir engravers. Historically, mountain pine beetle played an important successional role in mature white pine or lodgepole forests; the presence of mountain pine beetle led to various significant changes, including altered species composition and widespread tree mortality that resulted in fuel buildup and increased fire susceptibility. Douglas-fir beetle and fir engravers have always been present throughout the Clear Creek watershed, and both have been observed in the project area over the last 10 years. The presence of root disease in many of the Douglas-fir and grand fir forest types has resulted in even higher endemic levels of the Douglas-fir beetle and the propensity for rapid beetle population buildups during favorable conditions. Historically, short-term increases in fuel loading may have led to increased fire intensity and severity and subsequent development of openings conducive to regeneration of early seral species. In some cases, insect infestations may have contributed to large stand-replacing fires (USDA Forest Service 1998a).

White Pine Blister Rust

White pine blister rust was introduced into northern Idaho and this analysis area in the early 1900s. Blister rust is a fungal disease that forms cankers on branches or stems of trees; the cankers then weaken the trees and may eventually kill them. Weakened trees also become susceptible to other disease or to insect attack. Trees were either killed or harvest was accelerated to capture anticipated loss of economic value. In addition, the young white pine component (established following the 34 fires in 1910) was highly impacted by blister rust, as these young trees had little natural resistance, if any, to the disease. The project area has experienced substantial white pine mortality. Heavy fuel loads, along with increasing amounts of grand fir, are likely a result of high numbers of white pine succumbing to blister rust. The presence of live 50-year-old to 80-year-old white pine is an indicator of some level of natural genetic resistance to blister rust in these survivors. Natural blister rust resistance is thought to be <10%. The live white pine is an ecologically important component of the resource area, both in terms of its resistance to blister rust and because of its role as a successional component as the stands develop.

3.9.5.3.5 Harvest

Logging activities were initiated in the area in the 1960s. Known past harvest in the project area has been cataloged and summarized in Table 3-23. Regeneration harvest converted mature stands into younger and to smaller size classes. Additional regeneration harvest occurred at the same time on adjacent private and State property.

Table 3-23. Past Harvest Activities in the Clear Creek Project Area

Harvest Method	Year							
	1930–1939	1950–1959	1960–1969	1970–1979	1980–1989	1990–1999	2000–2009	Grand Total
Commercial thin	—	—	61	130	357	29	—	577
Fuel break	—	—	—	—	—	49	—	49
Improvement cut	—	—	—	—	—	27	64	91
Liberation cut	—	—	—	—	—	—	82	82
Clear-cut	136	578	3,686	2,367	1,075	1,143	353	9,339
Precommercial thin	—	—	232	712	127	285	109	1,465
Sanitation (salvage)	—	—	270	680	225	1,431	579	3,185
Seed tree harvest	—	—	738	420	95	226	78	1,557
Shelterwood harvest	—	—	58	240	603	272	159	1,333
Single tree selection	—	—	—	217	—	36	—	253
Total	**136**	**578**	**5,046**	**4,800**	**2,482**	**3,498**	**1,424**	**17,963**

3.9.5.4 Vegetative Conditions in the Project Area

3.9.5.4.1 Forest Composition

Forest cover types describe the dominant tree species present in a stand. The existing and desired forest cover types in the project area are displayed in Table 3-24. The forest cover types in the project area are primarily mixed conifers and shrubs. The Uplands and the Breaklands have relic, long-lived early seral species (western larch and ponderosa pine) but are primarily composed of late-seral, shade-tolerant species. Some scattered western white pines remain in the project area. The presence of long-lived early seral components can be used as an indicator of forest health. These species and their composition, structure, and functions have the desired resistance (ability to prevent impacts and protect valued resources), resilience (capacity of ecosystem to return to desired conditions after disturbance), and response (ability to transition from current to new conditions). Currently the project area is well out of the desired range for these species. This change is consistent with the Upper Columbia River Basin (USDA Forest Service 1997) and the Northern Region Overview (USDA Forest Service 1998a). While the Forest Plan does not mandate management at levels of historic species compositions and structures, these are helpful reference points to understand what trends may be needed over the long term to increase resiliency in the ecosystem.

Table 3-24. Existing and Desired Forest Cover Types in the Clear Creek Analysis Area

Dominance Type	Breaklands (36%) (Vegetation Response Units 3, 8, 12)		Uplands (63%) (Vegetation Response Units 7, 10, 17)	
	Desired Range (%)	Existing (%)	Desired Range (%)	Existing (%)
Ponderosa Pine/Mix	15–30	11	10–15	8
Douglas-Fir	15–30	32	10–15	15
Lodgepole Pine	0–5	<1	20–30	4
Western Larch	5–10	0	5–10	<1
Cedar/Grand Fir	9–17	54	25–50	59
White Pine	0–5	1	0–5	<1
Spruce/Fir Mix	0–5	2	0–5	7
Alpine Fir/Mt. Hemlock	0	0	0	<1
Seral Grass/Shrub	8–15	7	0–5	6
Non-Forest	10	0	3	0

3.9.5.4.2 Structural Stages—Age Class

Age class distribution is useful in describing the natural disturbance pattern on a landscape. VRU age class distribution is based on the Upper Columbia River Basin Environmental Assessment and incorporates data from Kapler-Smith and Fischer et al. (1997). Fires in 1880 and 1919, as well as past timber harvesting, have created the current age class distribution within the project area. The current and desired age class distributions are in Figure 3-2 through Figure 3-6. Figure 3-2, Figure 3-3, Figure 3-4, Figure 3-5, and Figure 3-6 represent conditions that could exist in 2017 if none of the action alternatives were implemented.

Figure 3-2. Current and Desired Age Class Distribution for Vegetative Response Unit (VRU) 3 (Breaklands)

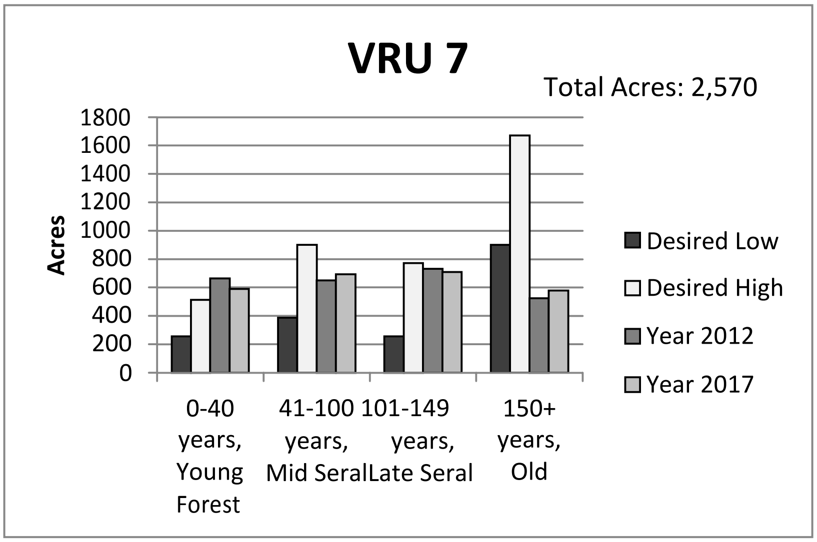


Figure 3-3. Current and Desired Age Class Distribution for Vegetative Response Unit (VRU) 7 (Uplands)

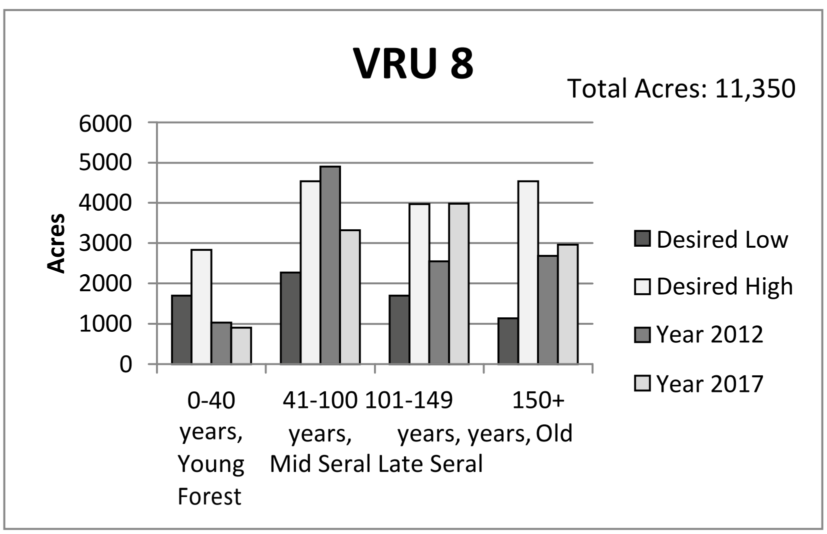


Figure 3-4. Current and Desired Age Class Distribution for Vegetative Response Unit (VRU) 8 (Breaklands)

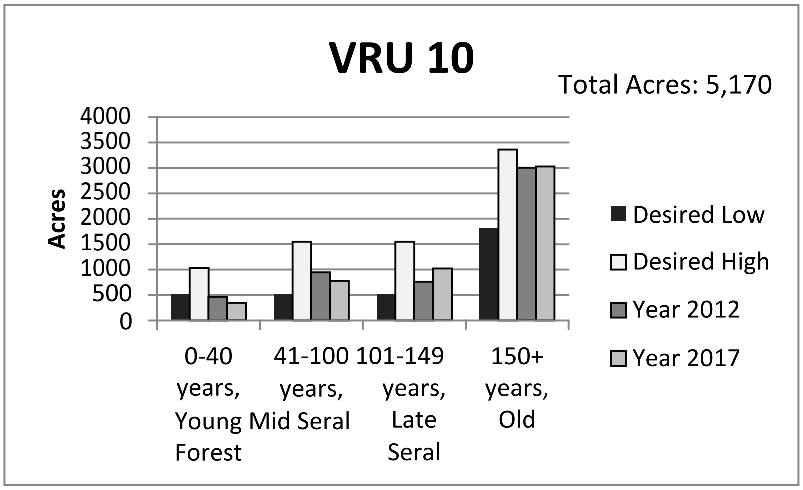


Figure 3-5. Current and Desired Age Class Distribution for Vegetative Response Unit (VRU) 10 (Uplands)

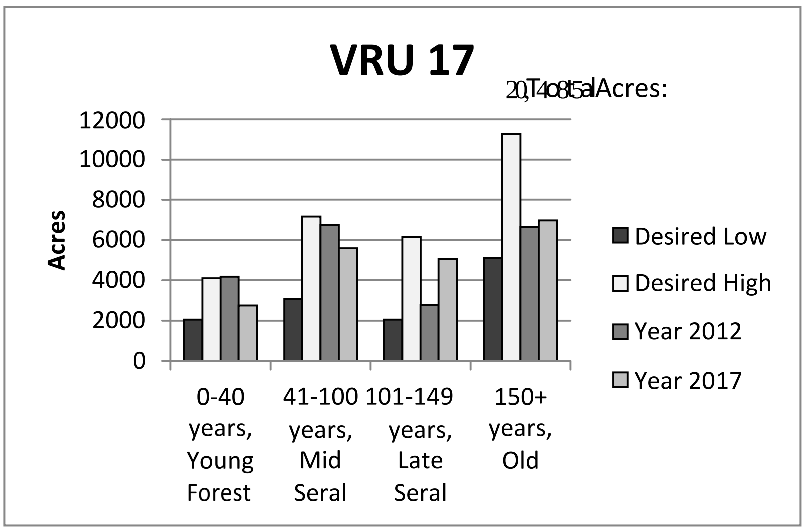


Figure 3-6. Current and Desired Age Class Distribution for Vegetative Response Unit (VRU) 17 (Uplands)

3.9.5.4.3 Vertical Structure

Vertical structure is used as a within-stand density indicator. Vertical structure depicts the number of vertical tree layers present in a stand (Berglund et al. 2008). The 4 vertical structure classes include single-storied (62% of the project area), two-storied (27%), three-storied (5%), and continuous (6%) vertical structure. The predominant class within the project area is the single-storied class, probably because the majority of the project area is in the stem exclusion stage. The single-storied stands will eventually enter the understory reinitiation stage and become multi-storied stands. The current condition is now within the desired range. It is desired to have dominance of single- and two-storied stands in the project area, with fewer areas of three-storied stands and continuous vertical structures. The single- and two-storied stands are favorable in terms of fuels management, and two-storied stands provide preferred habitat for some wildlife species.

3.9.5.4.4 Landscape Arrangement

The arrangement of stand size classes and vertical structures on the landscape influences the way some types of fire, insects, or wildlife will move across the landscape. Managing for connected landscapes is seen as a way to increase a landscape’s resilience and allow animal movement (and in some cases, plant movement). The creation of a vegetation mosaic, by design, allows the land manager to control, or at least ameliorate, hazards of all kinds (Brackebusch 1973).

Patch size and arrangement must be considered with all management actions: retaining resilient, large size class patches is an important objective; land managers must also consider that the young patch established this decade may become the most resilient old-growth patches in 150 years. Not all disturbance agents produce the same patch and scale characteristics. Mixed-severity fire causes a different patch size and arrangement on the landscape than large stand-replacing fire or insect and disease disturbances do. The current average patch sizes and ranges are displayed in Table 3-25. The desired condition varies by VRU but on average strives for patch sizes of 50–200 acres minimum and 1,000 acres maximum, with variable tree retention and forest connectivity where possible.

Table 3-25. Current Average Patch Size and Range

Structural Stage	Percent of Analysis Area by Structural Stage (%)	Average Patch Size (Acres)	Range of Patch Sizes (Acres)
Non-Forest	0	0	0
Seral Shrub	7	179	1–369
Stand Initiation	17	48	1–115
Stem Exclusion	26	115	1–434
Understory Reinitiation	17	62	1–153
Young Multi-Strata	3	27	1–21
Old Single-Strata	17	77	1–167
Old Multi-Strata	13	74	1–168

3.9.5.4.5 Old-growth Forest

The Forest Plan designates MA 20 to retain and to manage for old-growth habitats. MA 20 *"…is made up of forested lands…and occurs on a variety of landtypes. Approximately half of the area has a timber condition class of overmature sawtimber (150 years or older). The remainder of the area is comprised of immature stands (40–80 years) that will provide for replacement old-growth habitat"* (USDA Forest Service 1987a, p. III-56).

Data from the 2007 Forest Inventory and Analysis indicate that an estimated 13.4% of the Forest is old-growth habitat, as defined by Green et al. (1992). The lower and upper confidence interval bounds are 11% and 16.1%. The Forest meets the Forest-wide old-growth standard.

The Forest Plan objectives for MA 20 are to maintain viable populations of wildlife species that are dependent on old-growth habitat. At least 10% of suitable old-growth habitat would be managed as old growth for old growth–associated species. This acreage will be distributed across the Forest in a way that ensures that at least 5%of the forested acres within major prescription watersheds of 6,000–10,000 acres will be managed as old-growth habitat (USDA Forest Service 1987a, page II-6). Appendix N of the Forest Plan describes the preferred distribution requirements and outlines an old-growth identification process: "Old growth stands should be at least 300 acres. Next best would be a core block of 150 acres with the remaining blocks of no less than 50 acres and no more than ½ mile away from another old growth block. If existing old-growth blocks are less than 100 acres, the stands between the old-growth blocks should be managed as an old-growth complex" (USDA Forest Service 1987a, p. N-2).

Old-growth analysis areas (OGAAs) were designated across the Forest in order to maintain the minimum Forest Plan requirements for amount and distribution of old-growth habitats. The analysis area includes 7 OGAAs. Two of the OGAAs are small and do not meet the Forest Plan assessment scale of 5,000–10,000 acres. OGAA 618 is 1,036 acres, and OGAA 619 is 935 acres. For this analysis, these OGAAs were combined with adjacent OGAAs to comply with Forest Plan direction.

Verified old growth is defined by Green et al. (1992) in Old-Growth Forest Types of the Northern Region. Table 3-26 shows the verified old growth in each OGAA. The data derive from 2010, 2011, and 2012 stand exams, and field validation.

Table 3-26. Verified Old-Growth Habitat in Each Old-Growth Analysis Area (OGAA) in the Clear Creek Analysis Area

Old Growth Analysis Area	Old Growth Analysis Area Acres	Verified Old Growth	
		Acres	Percent (%)
40610	5,665	1,199	21
40611/618	7,935	933	13
40613	9,765	994	10
40615	12,928	1,141	9
40616/619	7,373	387	6
Total	**43,666**	**4,654**	**11**

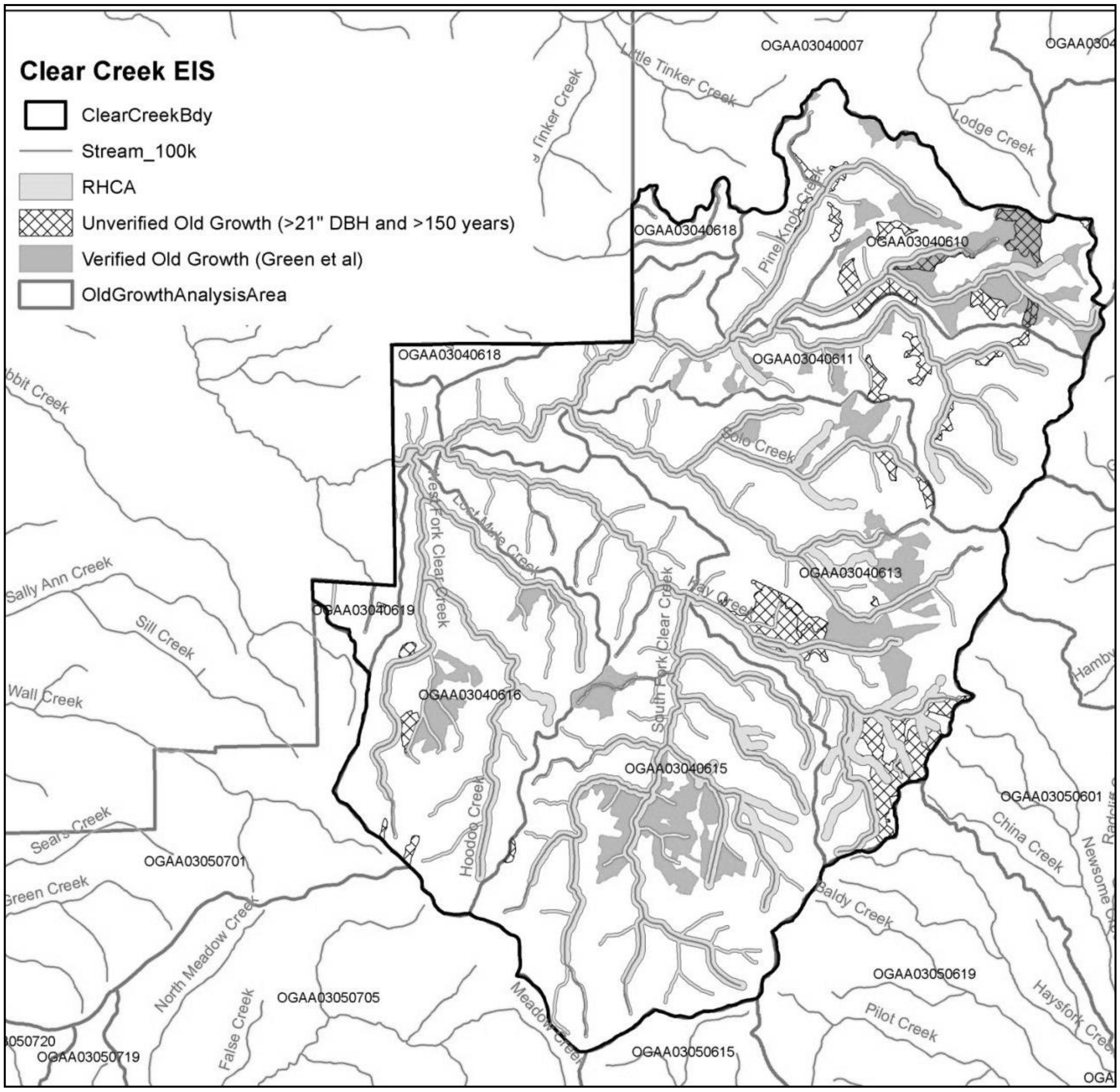


Figure 3-7. Clear Creek Verified Old Growth

The project area contains 11% verified old growth, which meets the Forest Plan standard. A total of 31 verified old-growth patches, ranging from 7 to 987 acres, exist within the OGAAs. Sixteen percent of the patches exceed the preferred 300-acre size, 28% are at least 150-acre core areas, 13% are between 50 and 150 acres, and 42% are <50 acres. Most of the small patches (<50 acres) are effectively enlarged by the adjacent RHCAs, which also provide linkages between all old-growth patches. This facilitates dispersal of old growth–associated species.

Additional old-growth forest is present in each of the OGAAs but has not been verified by recent stand exams. Stand data (TSMRS) show an additional 1,722 acres (4%) over 150 years old and over 21 inches average dbh (Table 3-27). Figure 3-7 shows the unverified old growth in each OGAA. Additionally, 24% of the analysis area is contained within RHCAs, which would be managed for future old growth.

3.9.5.5 Direct, Indirect, and Cumulative Effects

3.9.5.5.1 Alternative A—No Action

Alternative A would not affect MA 20 or old-growth forest habitats, because no activities would be conducted. Fire suppression would continue. Risk of large-scale stand-replacing fire would increase; the size or severity of such an event cannot be predicted.

MA 20 and old-growth habitats would continue to be altered by natural events such as succession, insect and disease, and wildfire. Some mixed-conifer habitats would mature and develop old-growth habitat characteristics, including multiple canopies, snags, and large downed wood, which provide habitat for a variety of wildlife species. Canopy openings created when snags fall would allow sunlight to reach the forest floor, providing for shrub, forb, and grass growth, which would become forage for ungulates and small mammals.

The risk of a crown fire would increase with increasing surface and ladder fuels. A wildfire would create large numbers of snags and would initiate young forest conditions. Canopy cover would be lost in varying amounts. A fire would reduce the amount of old-growth habitat available to species such as fisher, pileated woodpecker, goshawk, and American marten.

If no fires occur, cumulative effects on MA 20 would be an increase in the amount of suitable old growth as stands age. A negative cumulative effect would occur in the event of a wildfire that removed old-growth habitat. Predicting the size and severity of wildfire is not possible, so the level of potential cumulative effects cannot be determined.

3.9.5.5.2 Alternatives B, C, and D

The direct, indirect, and cumulative effects are analyzed for each of the 7 OGAAs. The time frame for cumulative effects is 150 years, which is the time required for stands to develop into old-growth habitat.

Forest Plan MA 20 would be allocated to 4,654 acres of verified old-growth habitat, which would meet Forest Plan old-growth standards. No treatment would occur in allocated MA 20 under any alternative; therefore, no direct effects to the resource would occur. MA 20 would continue to be altered by natural events, such as succession, insects and disease, and wildfire, under any action alternative. Habitat would remain available for fisher, American marten, pileated woodpecker, and northern goshawks (old growth–associated species). PACFISH buffers would provide for current and future old growth and would provide connectivity between old-growth patches and uplands. Thinning stands adjacent to old growth would increase their resilience to insects and disease, which would increase their survival and development into larger patches of future old growth.

Stand-replacing fire risk would be reduced on 7% of the analysis area through project activities. This could benefit MA 20 by making the landscape more resilient to wildfire and reducing the likelihood of stand-replacing fire in old-growth habitat. There could be a slightly positive cumulative effect to MA 20 when combined with fire suppression.

The Forest plan states, “Where possible, roads should not be located through or adjacent to old-growth stands in order to reduce human disturbance, loss of snags to firewood cutters, windthrow, and micro-climate changes” (USDA Forest Service 1987a, p. N-2). Alternatives B and C build 2 miles and Alternative D builds 1mile of temporary roads through old-growth habitats. The average length is 0.1 miles. Road building would remove an average of 0.4 acres of vegetation on 17 road segments under Alternatives B and C and on 13 segments under Alternative D; the total amount of old growth disturbed by temporary roads would be 7 acres and 5 acres, respectively (or 0.1% of all verified old growth). The largest impact would be removal of large green and dead trees, but the effects would be indistinguishable when compared to natural diversity and openings in old-growth habitats. The roads would be decommissioned after use. Temporary roads would cause no cumulative effects to MA 20.

3.9.6 Environmental Consequences

3.9.6.1 Direct and Indirect Effects at the Treatment Unit Scale in terms of Eco-setting

As noted above, the analysis area for direct and indirect effects of the alternatives is the project area.

3.9.6.1.1 Alternative A—No Action

Under the No Action alternative, no project activities would be conducted to maintain forest health or maintain resiliency. Activities to restore forest vegetation or increase its resilience would not be implemented. Two general trends would be expected to occur (Cooper et al. 1991).

Uplands

The Uplands make up 65% of the project area. The short-term effects of the No Action alternative would include increased mortality of Douglas-fir and grand fir as stands continue to mature and experience in-stand competition, root diseases, and decay. In addition, insects would continue to cause deterioration of stands dominated by these species.

The amount of existing early seral tree species in the project area would decline. The amount of medium and large size classes would decline as root disease and insects cause mortality. Grand fir and cedar would occupy the growing space left by the mortality of other species; stands would increasingly become dominated by grand fir and cedar (Byler and Hagle 2000). In the absence of natural disturbance such as fire, regeneration to fill gaps in the canopy would be limited to the same species of the current overstory, because white pine, western larch, and ponderosa pine will have limited seed sources. Douglas-fir would also gradually become less prevalent due to root disease and bark beetle mortality.

Stands would continue to grow, and the diameters of trees would increase; however, the rate of this growth would slow as overstory trees die and are increasingly replaced by understory (smaller-diameter) trees. Canopy cover would remain about the same, as vertical structures would continue to move the remaining single- and two-storied stands to three-storied stands and continuous-storied stands due to mortality. The landscape would become more homogeneous, with continuous vertical structures and multiple ages (Byler and Hagle 2000). Stands would develop old-growth characteristics over time; however, when compared to similar areas 100 years ago, these stands would have fewer long-lived early seral species, more vertical structure, and multiple ages earlier in their successional development. The landscape would increasingly become less resilient to change or disturbances. Overall, while the numbers represented by current conditions are closest to desired conditions, the indirect effects of the No Action Alternative and the combination of species compositions, landscape arrangement, and structures would trend more areas to lesser health, less resistance, and less resilience than the current condition or desired conditions.

The young age class (0–40 years) would continue to be underrepresented. Most stands currently within this age class will shift to the next age class (40–100 years) within 5 years.

Breaklands

Breaklands represent about 33% of the project area and contain a combination of Douglas-fir and dry grand fir habitat types, mostly on south-facing Breaklands. Indirectly, the No Action alternative would lead to increased grand fir and Douglas-fir as mortality in long-lived, early seral species continues due to competition and insects. Douglas-fir would not necessarily become less prevalent on the driest sites (because the lack of moisture limits natural regeneration of other species). Growing space opened by the Douglas-fir beetle mortality over the last decade would likely become grand fir and Douglas-fir, as that is the only seed source. This would continue as other disturbance agents cause mortality. Even if fire were to create sites for regeneration of long-lived early seral species of ponderosa pine, western larch, and western white pine, the lack of seed source would greatly limit this regeneration.

The effects on stand growth rate, canopy cover, vertical structure, old-growth development, and overall stand health and resilience would be the same as the effects described for the Uplands setting, above.

General Trends Common to All Eco-settings under the No Action Alternative:

- A substantial decrease in the young age class within the next 5 years
- An increase in multi-storied, multi-aged stands within stand structure due to the effects of root disease and bark beetles resulting from a continued absence of fire
- Continued increase of shade-tolerant cover types with the loss of shade-intolerant cover types
- An increase in the amount of mature structure
- A decrease in overall resistance, resilience, and response to ecological disturbance agents

3.9.6.1.2 Alternatives B, C, and D

Overview of Vegetative Aspects of the Proposed Action

The Collaborative Forest Landscape Restoration Program (Sec. 4003(c)) directs that restoration proposals shall be based (in part) on restoration strategies that

- incorporate the best available science and scientific application tools in ecological restoration strategies;
- fully maintain, or contribute toward the restoration of, the structure and composition of old growth stands according to the pre-fire suppression old growth conditions characteristic of the forest type, taking into account the contribution of the stand to landscape fire adaptation and watershed health and retaining the large trees contributing to old growth structure;
- would carry out any forest restoration treatments that reduce hazardous fuels by
  - focusing on small diameter trees, thinning, strategic fuel breaks, and fire use to modify fire behavior, as measured by the projected reduction of uncharacteristically severe wildfire effects for the forest type (such as adverse soil impacts, tree mortality or other impacts); and
  - maximizing the retention of large trees, as appropriate for the forest type, to the extent that the trees promote fire-resilient stands

The CFLRP program glossary defines Large Tree Retention as:

> Vegetation treatment methods applicable to areas outside of identified old-growth stands to maximize the retention of large trees in a manner that is appropriate for the forest type based on ecological characteristics and that will reduce uncharacteristically severe wildland fire effects with the treated area and reduce fire risk to communities, municipal water supplies, and at-risk Federal land (see also “Large Tree Retention” section of the HFRA/HFI Interim Guide).

Table 3-27 displays the proposed vegetative management activities for each alternative, including activities proposed for Focus areas and activities proposed for other land within the project area.

Table 3-27. Acres of Proposed Vegetative Management Activities, by Alternative

Activity	Alternative B	Alternative C	Alternative D
Within Focus Areas			
Regeneration (acres)	2,609	3,995	2,017
Commercial thin (acres)	2,240	854	1,997
Precommercial thin (acres)	998	904	998
Burn (acres)	1,371	1,371	1,371
Improvement (acres)	331	331	211
Restoration (acres)	41	41	41
Retention (acres)	3,940	3,940	4,892
Outside of Focus Areas			
Regeneration (acres)	0	161	161
Commercial thin (acres)	3,366	3,366	3,144
Precommercial thin (acres)	889	889	889

The main goal of the project is to reintroduce disturbance patterns that would mimic the natural disturbance that would be typical in a landscape where fire would have been the primary disturbance agent. The majority of the proposed regeneration harvest areas occur in stand types dominated by fire intolerant species such as grand fir (Tables 3-28 and 3-29). Historically, the most common fire regimes of the habitat types and VRUs located within the project area were lethal burns and mixed-severity fire. The absence of fire for nearly a century has created homogenous stand conditions in most areas that increase the probability that an uncontrolled fire would burn on more of a lethal regime (see fuels report). Such a fire could potentially damage resources and threaten communities.

Table 3-28. Existing Condition, Desired Range, and Shift in Species Composition for the Action Alternatives in the Breaklands

Breaklands (33%) (Vegetation Response Units 3, 8, 12)					
Dominance Type	Desired Range (%)	Existing (%)	Alternative B (%)	Alternative C (%)	Alternative D (%)
PP/WL/WP	20–40	11	17	18	15
Douglas-fir	15–30	32	29	28	30
Lodgepole pine	0–5	<1	<1	<1	<1
Cedar/grand fir	9–17	54	47	46	48
Spruce/fir mix	0–5	2	2	2	2
Alpine fir/ Mt. hemlock	0	0	0	0	0
Seral grass/shrub	8–15	7	7	7	7
Non-forest	10	0	0	0	0

Table 3-29. Existing Condition, Desired Range, and Shift in Species Composition for the Action Alternatives in the Uplands

Uplands (65%) (Vegetation Response Units 7, 10, 17)					
Dominance Type	Desired Range (%)	Existing (%)	Alternative B (%)	Alternative C (%)	Alternative D (%)
PP/WL/WP	15–30	8	13	17	14
Douglas-fir	10–15	15	13	12	13
Lodgepole pine	20–30	4	4	4	4
Cedar/grand fir	25–50	59	56	53	55
Spruce/fir mix	0–5	7	7	7	7
Alpine fir/ Mt hemlock	0	<1	<1	<1	<1
Seral grass/shrub	0–5	6	6	6	6
Non-forest	3	0	0	0	0

The project is designed to utilize existing small patches of young trees to create larger patches of young trees by implementing variable retention regeneration methods in appropriate adjacent stands, thinning through younger stands, and retaining 100% of the trees in some areas. The resulting mosaic created through harvest will serve to provide “fences and corridors” that limit fire spread and are a key to landscape resilience (Mckenzie et al. 2011, Chapter 3).

Structure classes in areas designed as full retention would not change, because the harvesting would not occur and incursions of prescribed fire into these areas would be minimal and classified as low-severity.

All activities within the Focus areas were designed to create a disturbance pattern that is similar to the size and scale of what historically would have been a mixed-severity fire. The location of the Focus areas was intended to utilize the existing young forest and the existing transportation system in order to break up fuels and homogenous stand conditions along probable fire pathways.

Regeneration harvest is used when stands have mortality rates that are higher than growth rates, either due to age or pathogens. Following harvest, stands receive site preparation and are reforested with long-lived early seral species that will increase resistance and resilience at the stand level and begin to trend the project area toward resistance and resilience. Management activities that favor resistant tree species on sites that are prone to or infected with root disease would be utilized (Rippy et al. 2005; Hagle 2006).

Treatment priorities were based on DFCs and take into consideration the VRUs and habitat types, landscape species, and structure objectives of the project area. Components within harvest areas that meet overall objectives (desired conditions) would be retained; where not present they would be established. Variability will be substantial within treatment areas because the amount of retention would be based on available components (e.g., large trees, preferred species). Wildlife, fire/fuels, and visual concerns played a prominent part in maximizing retention on sites while trending the overall area toward the DFC.

3.9.6.2 Direct and Indirect Effects of the Alternatives

Indicators focus on characteristics that contribute to forest health. Indicators are compared to the desired conditions. The desired conditions would trend the landscape toward increased ecological resistance and resilience to reasonably expected disturbances (e.g., fire, insects, disease, and weather). Analysis indicators are the same for direct, indirect, and cumulative effects. Indicators to be discussed in this section include forest composition, age class, vertical structure, and patch size. Current conditions reflect all past natural disturbances and management activities, and while this discussion considers those current conditions, it will only specifically address the effects of the action alternatives.

3.9.6.2.1 Direct Effects at the Treatment Unit Scale

Variable Retention Regeneration System

Variable Retention Regeneration systems (clear-cut with reserves) would establish and grow site-adapted western larch, white pine, and ponderosa pine while maintaining available and healthy western larch and ponderosa pine and groups of other species.

Silvicultural prescriptions will be designed for forest vegetation treatments that integrate fuel and other resource objectives. The treatment areas would resemble a mosaic of even-aged groups after harvest and planting activities are completed. In effect, these treatments are designed to mimic mixed-severity fires that create patches of forest structure, composition, and seral status (Perry et al. 2011). Overall residual tree retention would range between 14 and 28 tpa, based on a 12-inch dbh tree. Retention of biological legacy trees, both as individuals and small groups of trees and as undisturbed forest patches, is consistent with the goals of variable retention harvesting as described by Franklin et al. (1997) and Franklin and Johnson (2011a). Variable retention harvesting type methods have also been discussed in Graham and Jain (2005), Jain and Graham (2007), Franklin and Johnson (2010), Franklin and Johnson (2011), and Franklin et al. (1997). Silvicultural prescriptions will prescribe for the retention of large fire resilient trees. The best available representative western white pine, western larch, and ponderosa pine would be retained to serve as shelter and, in some cases, a seed source. Some level of shelter is needed on harsh sites to ensure regeneration success. Where fire resilient species do not exist, other large tree species will be left to the extent that is consistent with other objectives (e.g. wildlife, snags, woody debris). In some areas, large trees of selected species that are not fire adapted may need to be removed to promote greater fire resiliency and achieve other objectives such as “fences and corridors”. Retained trees would remain over the long term for structure and would result in stands with two-storied vertical structure. Species composition would meet desired conditions following reforestation. Prescribed fire would be used to prepare sites and reduce shrub competition so that planted seedlings could be established. Prescribed fire would also reduce post-harvest fuel loading. See Nez Perce and Clearwater National Forests Target Stands for Multiple Objectives in Appendix G.

Intermediate Treatments

An intermediate harvest is any treatment designed to enhance growth, quality, vigor or composition of the stand after regeneration but before final harvest (Helms, 1998). An intermediate harvest is not intended to regenerate anew stand, but to improve a developing stand. Some stand characteristics that indicate improved quality include, larger trees size, greater percentage of wood without knots, increase in percentage of preferred species, or reduction of ladder fuels. Clear creek intermediate treatments will not directly affect species composition, age class, or patch size at the unit scale. These treatments will, however, shift all the acres that have been treated to the single- or two-storied vertical structure.

3.9.6.2.2 Direct and Indirect Effects at the Resource Area Scale

Forest Composition

The project area is currently not within the desired range for forest composition. The composition within the project area is currently high in grand fir and red cedar and low in long-lived early seral species. Existing western larch would continue to decline due to inter-stand competition, while ladder fuels would continue to accumulate around existing ponderosa pine. The action alternatives would decrease the grand fir and red cedar dominance type and maintain/increase existing long-lived early seral species while reestablishing them in areas where they are currently underrepresented. Tables 3-29 and 3-30 represent the extent to which the action alternatives would shift species composition from the existing condition.

Age Classes

The action alternatives increase the younger age classes while slightly reducing the older age classes and maintaining the oldest age class. The oldest age class is currently well represented. Managing for long-term resistance and resilience within the project area would help maintain existing structure development into the older age classes. Table 3-30 depicts the shift in the young age class, as this is the only age class that can realistically be managed. The time frame for the direct effects to occur would be within 5–10 years. Based on this temporal scale, the analysis includes the existing condition (2012) and 5 years into the future, when implementation is expected to take place. This is an important distinction, as current condition for some VRUs would show they are well within the DFC for the young age class; however, after 5 years many of the acres in the young age class shift to the next age class (leaving them outside of the DFCs). Additionally, comments from the public during scoping expressed concern about a deficit of the very young (brush and seedling) stage. This deficit is a reality, as 1,575 acres of the project area are in the 0–19 age class. VRU 10 contains minimal activity acres, which are insignificant at the resource area and VRU scales and are not shown in Table 3-30.

Table 3-30. Shift in the Young Age Class (In Acres), by Alternative and Vegetation Response Units (VRU)

VRU	Alternative A	Alternative B	Alternative C	Alternative D
Breaklands	**VRU 3 (Desired Range = 450–750 acres)**			
0–40 Age Class (2012)	195	296	371	221
0–40 Age Class (2017)	142	206	318	168
	VRU 8 (Desired Range = 1,700–2,800 acres)			
0–40 Age Class (2012)	1,037	2,028	2,190	1,701
0–40 Age Class (2017)	909	1,900	2,062	1,579
Uplands	**VRU 7 (Desired Range = 250–500 acres)**			
0–40 Age Class (2012)	664	917	1,091	903
0–40 Age Class (2017)	590	843	1,017	829
	VRU 17 (Desired Range = 2,000–4,100 acres)			
0–40 Age Class (2012)	4,177	5,430	6,526	5,409
0–40 Age Class (2017)	2,744	3,997	5,093	3,973

Vertical Structure

Vertical structure is important when describing some types of wildlife habitat, fuel ladders and fire spread, and successional development. The vertical structure of the project area is well within desired condition. Vertical structure at this scale would not be changed by the action alternatives since all treatments would maintain a single- or two-storied vertical structure.

Patch Size

The desired condition strives for patch sizes from hundreds of acres up to 1,000 acres. Minimum patch sizes would be 50–500 acres, with variable retention and connectivity where possible. The current condition does not have patches of the desired size in any of the structural stages. Table 3-31 displays the shift in average patch size by successional stage. The action alternatives would decrease the later successional stages and increase early successional stages. The increase in patch size for the young-successional stage (stand initiation) would enable the establishment of long-lived early seral species where appropriate, which would increase long-term resilience and potential to desired patch sizes in the future. Locating regeneration treatments next to existing young forest leads to an increase in patch size among all of the structural classes.

Table 3-31. Shift in Average Patch Size by Successional Stage, by Alternative

Structural Class	Existing		Alternative B		Alternative C		Alternative D	
	Percent of Analysis Area (%)	Existing Mean Patch Size	Percent of Analysis Area (%)	Mean Patch Size	Percent of Analysis Area (%)	Mean Patch Size	Percent of Analysis Area (%)	Mean Patch Size
Seral shrub	7	179	6	252	6	252	6	252
Stand initiation	17	48	25	96	26	104	25	91
Stem exclusion	26	115	20	131	20	119	21	128
Understory reinitiation	17	62	20	83	18	83	18	83
Young multi-story	3	27	2	26	2	904	2	26
Old single-story	17	77	16	116	17	121	16	116
Old multi-story	13	74	11	81	11	72	11	81

Commercial Thinning

Thinning is a treatment primarily used to improve tree growth by reducing tree crowding and may recover valuable wood products from potential tree mortality. Commercial thinning is an intermediate harvest in which the primary goal is to improve growth rates in young, healthy stands by reducing crowding (USDA, 2008). The effects of commercial thinning are similar to the effects of improvement harvest. The trees that are removed during commercial thinning are large enough to provide valuable wood products, and the cost of commercial thinning is less than the value of the wood products that are removed (Helm, 1998).

The objective for commercial thinning is to maintain and/or improve diameter/tree growth with stocking control. Alternative B proposes 2,240 acres of commercial thinning inside the Focus areas, Alternative C proposes 3,995 acres, and Alternative D proposes 2,017 acres. This management activity was designed to mimic an underburn as part of a mixed-severity fire disturbance pattern. Outside of the Focus areas, Alternatives B and C propose 3,366 acres of commercial thinning, and Alternative D proposes 3,144 acres. All action alternatives were designed to address the issue of stands not reaching the culmination of mean annual increment; the action alternatives take advantage of thinning opportunity while maintaining and improving stand growing conditions. Approximately 40%–60% of the overstory would be removed, leaving the largest, healthiest ponderosa pine, western larch, white pine, Douglas-fir, and grand fir.

Treatment would result in a slight improvement in species composition compared to the No Action alternative but would not meet desired conditions. Stand structure would be much as it is now, with a reduction of the intermediate trees competing with the overstory. Fuel loading would be roughly the same, although canopy base height would be raised and canopy bulk density reduced. Mortality due to insects and disease would continue to change canopy and structure over the long term, with areas needing consideration for regeneration treatment in the next few decades. Gradual changes to growing space and conditions would favor regeneration of Douglas-fir and grand fir.

Precommercial Thinning

Pre-commercial thinning (PCT) is the removal of trees not for immediate financial return, but to improve growth rates for the more desirable remaining trees (Helms, 1998). Pre-commercial thinning is used in young stands of relatively small trees to reduce crowding which improves growth rates. Trees that are removed during pre-commercial thinning are usually too small to have commercial value.

All action alternatives allocate the same amount of acreage for precommercial thinning. The effects would be similar to the effects of commercial thinning. Early seral species would be retained, improving species composition by reducing competition and improving growing space. Approximately 200–300 tpa would remain following treatment.

Improvement Cutting

An improvement harvest is an intermediate harvest that removes less desirable trees to improve the composition and quality of the remaining stand. Clear creek improvement harvest would be used in stands that include large, old ponderosa pine and western larch. These stands would be thinned from below and would remove smaller trees which are ladder fuels. Reducing crowding would maintain or improve the health of the remaining trees and would reduce the risk of wildfire mortality.

Improvement cutting in the Clear Creek Integrated Restoration project is proposed in stands with an existing component of large, old ponderosa pine and western larch. In the absence of fire, these stands have substantial amounts of understory in-growth composed of grand fir and western redcedar. Improvement cutting would affect within-stand structure in much the same manner as a commercial thinning. The lower canopy would be reduced more than in a commercial thin, due to the focus on maintaining the large relic trees, reducing ladder fuels, and creating enough spacing to allow ground fire and prevent crown fire. This would increase the amount of air movement through the affected stands and increase the amount of sunlight reaching the forest floor relative to the existing condition of the stands. These two factors would increase the rate of drying of dead and down fuels during the summer months and may stimulate additional growth of understory herbs, shrubs, and shade-tolerant conifer regeneration. Slash and other dead and down fuels would be reduced through underburning following harvest. Underburning would also reduce ladder fuels, further increasing the distance between the ground and the base of the live overstory canopy. Improvement cutting typically increases the growth rate of the residual stand of trees. However, improvement cutting may also increase the rate of infection by root diseases in residual Douglas-fir and grand fir, because stumps and their attached root systems would become readily available for colonization by fungi that cause root disease. Included stands would have an even-aged overstory that may be uniformly distributed throughout the stand or may be clumpy and somewhat irregular where clumps of healthy white pine, western larch, or ponderosa pine are retained.

Planting of ponderosa pine, western larch, and/or western white pine may occur wherever pre-harvest mortality has resulted in the development of small openings in the improvement cuts. This planting would improve the long-term species diversity of the overstory and the long-term resilience of the stand(s).

Burning

See fuels specialist report.

Restoration

Restoration is proposed on dry, upland grassland habitats and on moist inclusions (historically dominated by shrubs). Patch sizes are limited by aspect and coniferous vegetation. Invasive forbs and grasses have been introduced and are becoming dominant. Historically, very frequent (5- to 20-year intervals), low-severity fire maintained open grasslands and rejuvenated shrub habitats. Ponderosa pine and an occasional Douglas-fir occur incidentally. Restoration activities would include herbicide application and prescribed fire for site preparation, followed by seeding of native species.

3.9.6.3 Cumulative Effects

The cumulative effects analysis area will be the entire 65,000-acre Clear Creek watershed. This area includes federal, state, and private lands. Cumulative effects will be analyzed15 years after project implementation. Regeneration harvest areas would be certified stocked within 5 years. However, by 15 years, the stand would be moving out of the plantation seedling/sapling stage and establishing tree dominance at the sapling/pole stage.

Past regeneration and intermediate timber harvests on the Forest were the only activities on federal lands considered for cumulative effects. No other present or foreseeable management activities on federal lands would affect vegetative composition, structure, arrangement, or disturbance types at the stand scale or at larger scales. Vegetative conditions on State and private lands were considered and reviewed using VMap. The Clear Creek watershed includes 24,235 acres of State or privately owned land, all of which is downstream from federal lands. Roughly 10,400 acres are in the grass or shrub cover type. The remainder is in a mixed grass/forest or forest cover type. Future timber harvest on forested private lands adjacent to the project area is expected. The Idaho Department of Lands (IDL) provided information regarding upcoming State and private harvest proposals. One private proposal involves harvest timber, but no acres were provided. The acres are expected to be small, since land ownership in the area appears as many houses on small (<100-acre) lots. The focus of harvesting on small, private ownerships is often salvage and/or partial harvest to remove dead/dying trees and/or trees of high economic value. In 2013, the IDL completed a 160-acre seed tree (regeneration) harvest directly adjacent to the Forest boundary and one of the proposed project harvest units (Unit 123). This harvest removed most of the trees and retained an average of 8 seed trees per acre.

3.9.6.3.1 Species Composition

Alternative A—No Action

The cumulative effect of this alternative would continue the long-term trends in loss of early seral species composition. This alternative would allow the continued decline of the remaining ponderosa pine and western larch present in these stands. Harvest activities on private and State lands would not contribute toward the establishment of early seral species, since both rely on natural regeneration to restock the stands. Shade-tolerant grand fir, cedar, and Douglas-fir typically regenerate on these sites.

Alternatives B, C, and D

All of the action alternatives trend the project area toward the DFC by creating openings large enough to establish long-lived early seral species at a scale that is large enough to measure. Alternative C trends toward the desired conditions the most, while Alternative D trends the least. Harvest activities on private and State lands would not contribute toward the establishment of early seral species, since both rely on natural regeneration to restock the stands. Shade-tolerant grand fir, cedar, and Douglas-fir typically regenerate on these sites. Therefore, no cumulative effects would occur at the analysis area scale.

3.9.6.3.2 Age Class

Alternative A—No Action

This alternative would have no effect on age class in the project area. The area would continue to be dominated by mid- and late-seral shade-tolerant species with a lack of young structure. Insects and disease would continue to be the major agents of change, resulting in multi-aged stands with continuous ladder fuels. Harvest on State lands increase the young age class by 160 acres, which at the analysis scale would have no measurable effect. Since no federal activities are proposed under this alternative, no cumulative effects to age class would occur.

Alternatives B, C, and D

The action alternatives increase the younger age classes while reducing the mature age classes and maintaining the oldest age class. The oldest age class is currently well represented. Managing for long-term resistance and resilience within the project area would help maintain existing structures develop into the older age classes. Placement of the proposed regeneration treatments next to existing stands of young forest helps trend the analysis area toward the desired condition. Regeneration harvest on state land adds 0.2% toward the DFC for younger age class.

3.9.6.3.3 Vertical Structure

Alternative A—No Action

Although the vertical structure of the resource area is well within desired condition, the stands proposed for regeneration treatment are in the stem exclusion phase. They are currently transitioning into the understory reinitiation and a multilayer condition due to age and natural change agents. The No Action alternative would ultimately result in an area dominated by stands with continuous vertical structure, causing the area to eventually fall out of the range for DFCs.

Alternatives B, C, and D

All the action alternatives would continue to maintain the desired range for single- and two-storied stand conditions through regeneration, intermediate harvest, and precommercial thinning. Regeneration harvest on State lands would also maintain these conditions. Cumulatively, a slight positive effect to vertical structure would occur.

3.9.6.3.4 Patch Size

Alternative A—No Action

This alternative retains the existing patch sizes, which are and would remain, on average, small and fragmented. No activities are proposed that would alter patch size on federal lands. The 160-acre IDL harvest would not contribute to increases in patch size on federal lands. Since no activities are proposed under this alternative, no cumulative effects to patch size would occur.

Alternatives B, C, and D

All action alternatives increase average patch size across all structural stages and reduce the number of patches overall within the area. All action alternatives trend the area toward the DFC by increasing patch size of existing older forest and increasing the representation of long-lived early seral species in new large patches. The harvesting on State land would contribute only slightly to increasing patch size in the cumulative effects analysis area by creating new openings adjacent to existing openings.

3.10 VISUALS

The Clear Creek Integrated Resources Project area of interest is located in the rolling uplands to the south of the Lochsa River canyon between the South Fork of the Clearwater River drainage to the west and the Selway River Drainage to the east. The area of interest is approximately 5 miles from the community of Kooskia, Idaho. Treatment areas are located to the south of Forest Road (FR) 286 and north of FR 284, also known as the Elk City Wagon Road.

The Clear Creek project proposes management activities including prescribed fire, commercial and pre-commercial thinning, reforestation, and timber harvest to achieve more healthy and resilient vegetation across the landscape. These activities are designed to create a landscape that exhibits more natural disturbance patterns. Also included in the project are road decommissioning, culvert replacement, and road activities designed to improve watershed health. Vegetative diversity improvements will not be limited to coniferous vegetation, approximately 41 acres of bunch grass communities are proposed for restoration through re-vegetation with native grasses and forbs.

Planned activities would be visible in foreground, middleground and background views from Forest Road 286 and Forest Road 284 which are identified as visual travel corridors in the Nez Perce National Forest Plan. Also within the area of interest is the Lookout Butte Lookout which is utilized as a recreation rental during the summer season. Corral Hill Lookout and Trails 130, 728, 723, 139, 150, and 151, are designated in the Forest Plan as travel corridors or use areas and have mixed levels of recreation use associated with them.

This report analyzes the visual impacts of the proposed management activities and determines whether the activities would meet Forest Plan standards for scenic quality. Visual simulation techniques are used to analyze these visual impacts. Numerous viewpoints were reviewed to determine the short and long term impacts to scenery within the resource area.

3.10.1 Analysis Area

The geographic scope of the scenery analysis for the Clear Creek Integrated Restoration Project includes areas visible from key locations both within and outside the area of interest. Table 3-33 lists all key viewpoints or viewing corridors and their sensitivity levels identified in the 1987 Nez Perce National Forest Plan which are relevant to the Clear Creek Project scenic quality analysis. Direct and indirect effects analysis focuses on the viewshed within which the proposed activities can be seen from these viewpoints, and the extent proposed treatment units affect the Visual Quality Objectives (VQOs) assigned to that piece of ground. The cumulative effects area is similar to that for the direct and indirect effects, except that it takes into account the whole viewshed, as opposed to focusing on the individual units and surrounding area. The temporal scope of the analysis is limited to the 25–30 years following harvest activities—the length of time openings created by regeneration harvest are likely to be evident.

3.10.2 Regulatory Framework

The 1987 Nez Perce National Forest Land and Resource Management Plan provides standards and guidelines for scenic quality for the Nez Perce–Clearwater National Forests within the area of interest (Table 3-32).

The desired condition for scenic quality within the area of interest would be to retain the existing landscape character and maintain the designated visual quality objectives of partial retention, modification, and maximum modification from travel corridors and use areas. The foreground viewing zone of FR 284 and 286 and the trails listed below have the VQO of partial retention (Table 3-32) while several minor trails have VQO of modification in the foreground.

Table 3-32. Nez Perce National Forest Plan (1987) Visual Quality Objectives

View Point or Viewing Corridor	Sensitivity Level	Foreground 0–¼ miles	Middleground ¼–3 miles	Background 3–5+ miles
FR 184 (Pilot Creek to China Point)	1	Retention	Modification	Modification
FR 284 (China Point to Forest Boundary)	2	Partial Retention	Modification	M. Modification
FR 286	2	Partial Retention	Modification	M. Modification
Lookout Butte Lookout Rental	1	Partial Retention	Modification	M. Modification
Corral Hill Lookout	2	Partial Retention	Modification	M. Modification
Trail 130	1	Partial Retention	Modification	M. Modification
Trail 150	1	Partial Retention	Modification	M. Modification
Trail 151	2	Modification	Modification	M. Modification
Trail 197	2	Modification	Modification	M. Modification
Trail 723	2	Modification	Modification	M. Modification
Trail 728	1	Partial Retention	Modification	M. Modification

3.10.3 Resource Indicators

General direction for scenery management is provided Forest Service Manual 2380 (Landscape Management). Specific visual resource management direction is provided by the 1987 Nez Perce National Forest Plan and is described in terms of Visual Quality Objectives (VQO). Forest Plan VQO standards and guidelines were based on the Visual Management System described in Agriculture Handbook Number 462, National Forest Landscape Management, Volume 2 (PF-Doc. PI-R02). The visual management system was revised in 1995, and is now known as the Scenery Management System. The revised guidelines are provided in Agricultural Handbook 701, Landscape Aesthetics: A Handbook for Scenery Management (USDA Forest Service, 1995; PF Doc. VIS-R01).

VQOs provide measurable standards for scenery management in conjunction with demands for goods and services from the forest. Scenic resource management is integral to all management areas and implied in all management goals. The Forest Plan standard relevant to the Clear Creek visual resources are:

- Meet adopted visual quality objectives (VQOs).
- The visual resource has been evaluated based on visual sensitivity levels assigned to travel routes, use areas, and water bodies.

The analysis considers the character and appearance of the surrounding natural landscape and the VQOs of areas proposed for treatments as assigned under the current Forest Plan. VQOs are a desired level of scenic quality and diversity of natural features based on physiological and sociological characteristics of an area, and refers to the degree of acceptable alterations of the landscape Management activities such as commercial timber harvest, prescribed burning, and road construction can alter the scenic character of the landscape. There is a potential concern that activities proposed under the action alternatives could adversely affect visual resources to the extent that the Visual Quality Objectives (VQOs) established by the current Forest Plan (1987) would not be met.

Effects to the visual resource are discussed in general terms; however, the indicator used to measure effects would be whether or not VQOs are achieved (Table 3-33). Visual Quality Objectives are listed in Table 3-32 for the Clear Creek Project. Below is a brief description of each objective level.

- *Preservation*: In general, human activities are not detectable to the visitor.
- *Retention*: Human activities are not evident to the casual Forest visitor.
- *Partial Retention*: Human activities may be evident, but must remain subordinate to the character of the landscape.
- *Modification*: Human activities may dominate the characteristic of the landscape but must, at the same time, utilize naturally established form, line, color, and texture.
- *Maximum Modification*: Human activity may dominate the characteristic landscape, but should appear as natural occurrences when viewed as background.

Scenic resources are managed using the Visual Management System (VMS) which specifies the Visual Quality Objectives (VQOs) for designated areas. VQOs are based on the area seen from sensitive viewpoints such as travel corridors and other features where there may be a high visual sensitivity level.

Table 3-33. Resource Indicators and Measures for Assessing Visual Effects

Resource Element	Resource Indicator	Measure	Used to Address P/N or Key Issue?	Source
Scenic Quality	Visual Quality Objectives	Meet Visual Quality Objectives	No	Forest Plan

3.10.4 Analysis Methodology

Although the Visual Management System (PF Doc. VIS-R02) has been replaced by the Scenery Management System (PF Doc. VIS-R01), this analysis uses terminology used in the Forest Plan which was developed and written under the former. A crosswalk between the two systems is found in Agricultural Handbook 701, Appendix A (PF Doc. VIS-R01). A variety of tools were used in the visual resource analysis including analyzing VQO maps and visibility modeling.

Treatment units and their associated VQOs were evaluated in relation to visually sensitive viewpoints to determine the extent to which proposed activities would likely be seen, and the likelihood that those activities would adversely affect VQOs. VQO maps prepared under the Forest Plan are very general in nature. Scenic class and sensitivity level can provide a general understanding; however, the maps can’t always illustrate how visible specific treatments would be from locations of concern, or the extent to which treatments are likely to stand out or blend with existing scenic features.

Points on VOQ maps with direct line of site to treatment units were identified. Units were observed from these locations, using unit maps. Units are found in the foreground, middleground, and in the background when viewed from key viewpoints. To assist in determining unit visibility, the analysis utilized Google Earth (Google Inc. 2012). Treatment units for each alternative were imported into Google Earth and draped over the landscape. Units were then viewed from ground-level or "street view" at a variety of representative sensitive locations, including: Forest Road 286, 284, Lookout Butte Lookout, Corral Hill Lookout, and Trails 723, 728, 130, 150, 151 and 197. This 3-D modeling gives a different perspective on how visible a given area is from a specific geographic location. A limitation of using Google Earth for determining visibility is that near view screening from adjacent trees cannot be taken into consideration; for instance, if you are on a trail or road, the 3-D imaging cannot place you down amongst the trees, where your view might be obscured by trees and other vegetation in the foreground.

After establishing relative sensitivity of affected areas when viewed from key viewpoints, Agricultural Handbooks 462 and 701 were used as references to determine if proposed activities were likely to modify the landscape to the extent that visual quality objectives could not be met.

3.10.5 Affected Environment

The Clear Creek Integrated Restoration Project is located in the Columbia Rockies Subregion, within the Bitterroot Mountain Range. The existing landscape character is one of rolling hills, deep canyons, and mixed conifer vegetation. These features are commonly found throughout the Middle and South Fork of the Clearwater drainages and their tributaries.

The vegetation is continuous coniferous cover consisting mostly of late seral, non-fire resistant mixed conifer and lodgepole pine forests. There are some areas of rock outcrops and some natural vegetative openings, but these elements are a minor component of the landscape character. Broad views of the rolling hills are commonly found along FR 286. Much of the vegetative cover shows evidence of aging and disease. Within the viewshed of the FR 286 the rolling hills have numerous man-made openings in various stages of regeneration.

There are a number of recreation activities that occur within the Clear Creek drainage including dispersed camping, motorized and non-motorized trail use, driving for pleasure, berry picking, and firewood gathering. Lookout Butte Rental Lookout is a popular destination. To the south of the project area is the Elk City Wagon Road and the route of the Southern Nez Perce Trail. Located adjacent to the Elk City Wagon Road is the Corral Hill Lookout. The Elk City Wagon Road route is heavily vegetated, allowing few views north toward the project area.

Minor trail segments are found throughout the area of interest, but the most popular destinations for trail use are found in the central portion of the Middle Fork of Clear Creek drainage. Bisecting the area west to east are Trails 728, 130 and 151. These trails follow the ridgeline above Clear Creek and have view into the drainage. Trail 723 is found in the canyon of Clear Creek and Trail 150 is found east of the South Fork of Clear Creek.

The Clear Creek area is easily accessed by local residents of Kooskia and other small communities along FR 286. Access from the Elk City Clearwater area is more difficult, with travel over FR 284 which is generally only suitable for high clearance all-wheel drive vehicles. Within the central portion of the area of interest is the Clear Creek Roadless Area which has the theme backcountry restoration.

While there is evidence of past harvest activities and manmade improvements, these modifications do not dominate the existing landscape character and therefore meet the existing visual quality objectives of partial retention, modification and maximum modification. Areas of vegetative mortality within the existing vegetation do affect the scenic nature of the canyon area.

3.10.6 Environmental Consequences

All alternatives in this project will meet the Nez Perce National Forest Land Management Plan Visual Quality Objectives.

3.10.6.1 Direct and Indirect Effects

3.10.6.1.1 Alternative A

There would be no direct or short-term affects to the scenic condition of the area since no harvest activities would occur. The openings in forest cover that are visible as a result of past forest management would continue to recover tree growth, and overtime would recover unnatural appearing openings. Processes affecting forest dynamics would continue, including continuing insect and disease related mortality. The amount of dead and diseased coniferous vegetation would continue to increase. While for some this may have a negative impact on the scenic quality of the area, these are considered natural processes therefore the resource area would continue to meet assigned VQOs.

3.10.6.1.2 Alternative B

Alternative B proposes to modify the existing vegetation through harvesting and burning activities to improve forest health, improve wildlife habitat and reduce the fire hazard. Activities will be grouped in “focus areas” where use of “variable retention” techniques will be used to improve patch size, increase the amount of early seral forest and replant with a mix of species that would improve the long-term resilience of these stands. Healthy stands would be commercially thinned, while stands where root disease was detected would be deferred. The project proposes to treat approximately 8546 acres of the area of interest using regeneration harvest (2,609 acres), improvement harvest (331 acres), and commercial thinning (5,606 acres). Approximately36.3 miles of temporary road will be needed to complete this alternative including 8.7 miles of temporary road on existing templates and 27.6 miles of new construction.

This analysis is mainly concerned with the landscape that can be observed from viewpoints identified in the Forest Plan. Proposed activities that are blocked from these viewpoints by terrain are considered to be in compliance with VQOs. Proposed management actions that have concern from a scenic resource standpoint are evaluated for how they conform to naturally occurring features that exist or could be created by natural events. Many of the proposed management features have short term visual effects, but would not have long term effects on the overall landscape character of the area of interest.

The management activities proposed for the Clear Creek area are located within the middleground and background viewsheds of Forest Roads 286 and 284, Lookout Butte Rental Lookout, Corral Hill Lookout, and Trails 130, 150, 151, 723 and 728. Although not included in the Nez Perce National Forest Plan, the area is also visible from several minor trails found throughout the Clear Creek drainage. Most of the proposed units would be visible from one or more of the viewpoints found within and surrounding the area of interest.

View from Forest Road 286

For the most part, views of the area of interest are screened by vegetation and topography for this major access road. There are some viewpoints where there are limited views of the area. Near unit 101 retain vegetative screening to protect views of unit 101 in the foreground in the northwest portion of the area of interest. In the northeastern portion middleground views of units 108, 109, 122, 126, and 130 would meet the VQO of Modification from the roadway. These units will remove vegetation that is adjacent to past harvest units reducing some of the straight edges of those existing openings. The new opening will be larger, but will have the appearance of a natural opening created by fire or other natural event.

View from Lookout Butte Lookout Rental

The only harvest activities in the foreground views of the lookout are commercial thinning, which will retain the majority of the canopy cover and should not appear as openings. In the middleground view are a number of regeneration harvest units. Units 103, 109 and 114 will be seen along several of the ridgelines, but should be viewed from the side so that the edges are not as apparent. With edge feathering and some retention of vegetative structure these openings should meet the VQO of modification in the middleground. Unit 159 to the northwest of the lookout is a large unit that borders past harvest units. The boundary of the unit follows natural breaks where possible, and even though large in size still is within the scale of existing natural openings created by fire events. There are also natural rock outcrops in this unit that will increase the natural appearance of the opening. Thinning in unit 307 can be increased along the boundary with Unit 159 also to create a more natural edge.

Views from Trails

The trails with the highest sensitivity level are found to the north and south of the South Fork Clear Creek drainage. They include Trails 728, 130 and 150. VQOs in the foreground from these trails are partial retention and modification/max. modification in the middleground. These trails are found on either side of the drainage and are within the Clear Creek Roadless Area. For the most part these trails are screened with vegetation and topography from the proposed harvest activities, but there are some areas where there are viewpoints. Units adjacent to Trail 155 to the south of Trail 130 can be seen from limited viewpoints in the middleground, but there are no proposed harvest activities adjacent to these trails except for the commercial thinning Unit 122. Vegetation within the immediate foreground of the trail should be retained, but commercial thinning should not alter the viewshed and would therefor meet the VQO of partial retention in the foreground. Design measures of edge feathering and retention of stand structure in Units 122 and 130 would meet the criteria for modification in the middleground for these trails.

Views from Corral Hill Lookout

A number of the focus areas for vegetative treatment can be seen from Corral Hill Lookout. Units 134 and 135 can be seen in the close middleground viewshed. Treatment of the edges and retention of some stand structure will be critical to retain the natural appearance of these openings. Units 101–103 will appear in the far middleground view. These units will harvest several ridgelines above clear creek. Edge feathering will be critical to maintain the appearance of natural openings in the far middleground viewshed. Units 150–154 will appear as one large opening to the northeast of the lookout in the middleground view. Units 147–149 can be seen in the background view of the lookout. The large improvement cut, 505 will also be visible from this lookout. Commercial thinning units throughout the area of interest are also seen from this viewpoint. The appearance from this viewpoint will be changed from the existing condition, but with design measures, openings will emulate natural processes and will reduce the existing straight edges of past harvest activities.

Overall there will be significant changes to the visual appearance of the Clear Creek drainage and its tributaries. Most proposed units are located adjacent to past harvest areas and will be designed to emulate the visual appearance of past fire activity or other natural openings. With design measures to reduce the man-made appearance of proposed openings, these focus areas will be returned to a more resilient vegetative cover with appropriate seral species and age class mix.

Temporary Road Building

There are 36.3 miles of temporary road building proposed in Alternative B. Of that total, 8.7 miles of temporary road will be built on existing road templates and should have minor visual impacts. The remaining 27.6 miles will be new construction. There will be some visual affect when these roads are constructed, but all of the new construction will only be evident in the middleground viewshed and will meet the VQOs of Modification and Maximum Modification for those areas.

3.10.6.1.3 Alternative C

Alternative C also proposes to modify the existing vegetation through harvesting and burning activities to improve forest health, improve wildlife habitat and reduce the fire hazard. This alternative proposes to use regeneration harvest rather than commercial thinning in areas that may be experience disease outbreaks. This alternative proposes to treat approximately 8,707 acres of the area of interest using regeneration harvest (4,156 acres), improvement harvest (331 acres), and commercial thinning (4,220). Temporary road construction of 36.3 miles will be the same as proposed in Alternative B.

Harvesting and burning activities in Alternative C will have greater impacts to the visual resource than Alternative B. Twenty-five of the commercial thinning units proposed in Alternative B will be regeneration units in Alternative C. The change is most evident from Corral Hill Lookout. But can also be seen from Lookout Butte Lookout also. The close middleground views will have larger and more numerous large openings requiring design measures of edge feathering and retention of stand structure to maintain the VQO of modification in the middleground.

The viewshed from Trail 728 and Trail 150 will be affected near Units 139–141. Commercial thinning units within this focus area will become regeneration units. Unit 221 which is immediately adjacent to trail 150 will now be a regeneration unit. Retention of vegetative screening will be required to maintain the VQO of partial retention in the foreground from this trail. Edge treatment and careful retention of stand structure through the remainder of the units will be needed to maintain the natural appearance of the area in order to meet the VQO of partial retention from these trails.

3.10.6.1.4 Alternative D

Alternative D proposes harvest of the existing vegetation through harvesting and burning activities to improve forest health, improve wildlife habitat and reduce the fire hazard, but uses more commercial thinning rather than regeneration harvest proposed in either Alternative A or B. This alternative proposes to treat approximately 7.530 acres of the area of interest using regeneration harvest (2,178 acres), improvement harvest (211 acres), and commercial thinning (5,141). Temporary road construction is proposed to be 17.5 miles to reduce effect on wildlife and water resources.

Harvesting and burning activities in Alternative D will have the fewer impacts on the scenic quality of the Clear Creek drainage and its associated recreation facilities as Alternative B or C. The number of regeneration harvest units will be reduced by eleven from Alternative B and by 36 from Alternative C.

There will also be fewer miles of temporary road building with a reduction from approximately 36 to 17 miles of temporary roads.

3.10.6.2 Cumulative Effects

3.10.6.2.1 Alternative A

There would be no change in the scenic quality of the area of interest under Alternative A in the short term, but the risk of wildfire would increase with time. The existing openings would continue to regenerate and within 10 to 15 years would no longer appear as openings. The potential for wildfire would remain. Alternative A would not change the landscape character of the geographic area encompassed within the Clear Creek drainage and its tributaries.

3.10.6.2.2 Alternative B

Since the 1970s there have been timber harvest activities throughout the drainage. Evidence of these activities is visible, but does not dominate the existing landscape character of rolling hills with continuous coniferous vegetation. Past harvesting is in various stages of regrowth, with many areas no longer having the appearance of an opening. There are a number of openings to the within the Clear Creek area of interest that still appear as opening, but they have young plantations that will continue to mature and will no longer appear as an opening within 10 to 15 years.

There is some evidence of past burning activities, but they are minimal and will only have an impact in the short term. Within 5 years these activities will no long be visible.

The proposal would blend existing units with the proposed units, emulating the appearance of areas that have undergone changes through the natural processes of fire and insect and disease. Thinning is proposed for the previously harvested area, designed to blend into the proposed harvest areas so that unnatural geometric openings are not created. Given the aspect and growing history of the area, the openings created by this proposal would no long appear as openings within 25–30 years, but should appear as an area that has experienced the natural process of wild fire rather than man-made openings.

3.10.6.2.3 Alternative C

The cumulative effects in Alternative C will be more visually apparent than Alternative B. This will be especially evident from the Corral Hill Lookout and from Trail 150 and 728.

3.10.6.2.4 Alternative D

The cumulative effects in Alternative D will be the less than either Alternative B or C. Regeneration harvesting will be reduced and temporary road building will be reduced in this alternative.

3.10.6.3 Effects Determination to the Resource Indicator for All Action Alternatives

Past activities are in various stages of re-vegetation, with young timber stands blending in with more mature vegetation. Past activities have utilized harvest methods that left little stand structure within the harvest areas and most areas do have geometric appearance that emphasizes the man-made opening. Past activities either no long appears as openings or are small enough that they do not dominate the existing landscape character and therefore meet the Forest Plan Standards for Visual Quality Objectives. Proposed activities under all action alternatives will reduce the visual effects of those unnatural openings and openings will be natural appearing in the middle and background viewshed so they will not dominate the existing landscape character and therefore meet the Forest Plan Standards for Visual Quality Objectives. The effects of temporary road building will be minimal, since most will not be visible (Table 3-34).

Table 3-34. Summary Comparison of How the Alternatives Address the Key Issues for Visuals

Issue Indicator/ Measure	Alternative A No Action	Alternative B Proposed Action	Alternative C	Alternative D
Meeting VQOs	Will meet VQO, but the scenic character of the area will continue to be affected by increases in dead and dying vegetation due to insect and disease. The area will also be susceptible to catastrophic wildfire.	Although activities will be visible, the harvest and burning proposed will meet the VQO of partial retention in the foreground, modification, and Modification/Max. Modification in the middleground and background. Temporary roads will be visible but will not dominate the existing landscape character. Design measures will be needed for some units to maintain the natural appearance of the area.	Harvest activities will have the greater effect on the scenic character of the area. Trail 150 and 728 will have regeneration harvest activity within the foreground viewing zone. Design measures will be critical to maintain the natural appearance of the viewshed especially in the foreground and near middleground views from critical travel corridors and use areas.	Harvest activities will have less impact to the scenic resources that alternative B or C. Regeneration harvest and temporary road building have been reduced in this alternative. Design measures will still be needed to maintain the VQO objectives in foreground and near middleground viewsheds from critical travel corridors and use areas.

3.10.6.4 Effects Common to All Action Alternatives

Pre-commercial Thinning

In all action alternatives 1,887 acres are proposed for pre-commercial thinning. The activities outlined for pre-commercial thinning will retain the majority of canopy cover within those harvest units and would there have no long-term effect on the scenic quality of the analysis area.

Grass Restoration

In all action alternatives 41 acres are proposed for restoration of native grasses and forbs. This proposal would rehabilitate the area and would therefore have a positive long term effect on the scenic quality of that landscape.

Fuels Treatment

1,371 acres of prescribed fire are proposed in all action alternatives. The effect of these activities will appear as a natural occurring event and although the burns will change the appearance of the landscape they will appear as a natural process. These activities will meet the scenic quality objectives for the area of interest.

Transportation System

There is no new road construction proposed in this project. There are 119.8 miles of road reconstruction, 48.8 miles of road reconditioning, and 13.2 miles of road decommissioning proposed in all action alternatives. There may be some short term effects from ground disturbance related to these activities, but the effect will be limited to the existing road template and its immediate surroundings. The scenic impact of these activities will be minimal and will not affect the scenic quality of the area.

3.10.6.5 Compliance with Forest Plan and Other Relevant Laws, Regulations, Policies and Plans

This area currently meets the Nez Perce National Forest Plan Visual Quality Objectives of Partial Retention in the foreground and Modification/Max. Modification in the middle and background viewing zones from all identified viewpoints and viewing corridors. Although there are currently harvest units that appear as openings they do not dominate the existing landscape character of the area.

3.11 WATERSHED

This section summarizes the effects of the alternatives on water quality and quantity. This section was summarized from the "Clear Creek Restoration Project Watershed Report," located in the project record.

3.11.1 Analysis Area

The Clear Creek Integrated Restoration Project encompasses 43,730 acres within the greater 58,990 acre Clear Creek watershed (HUC 10 #1706030401). Clear Creek is a tributary to the Middle Fork Clearwater River.

The direct and indirect effect areas for sediment yield, water yield, ECA, and road density indicators are the 10 Forest Plan prescription watersheds located within the project area. Water yield, ECA, and road densities were also analyzed for the three HUC 12 subwatersheds within the project area: Upper Clear Creek, South Fork Clear Creek, and Lower Clear Creek. The cumulative effects area for all indicators is the Clear Creek watershed (HUC 10).

3.11.2 Regulatory Framework

Nez Perce Forest Plan direction and all federal and State laws and regulations applicable to watershed resources would be applied to the Clear Creek project, including the Clean Water Act, Idaho Water Quality Standards, Idaho Forest Practices Act, Idaho Stream Channel Protection Act, and EOs 11988 and 11990, and Soil and Water Conservation Practices (SWCP) Handbook, FSH 2509.22.

The Clear Creek project was designed to comply with these directions and water quality conditions would be improved or maintained following project activities. Streams would continue to support beneficial uses.

3.11.2.1 Nez Perce National Forest Plan

Forest standards for water resources are found in the Nez Perce National Forest Plan on pages II-21 through II-22 and Appendix A (USDA Forest Service 1987a) and are shown in Table 3-35.

The Forest Plan was amended in 1995, following a joint decision (commonly called PACFISH) by the U.S. Forest Service and BLM for managing anadromous fish-producing watersheds on federal lands (Forest Plan Amendment 20). This amendment also includes direction for restoration opportunities and cooperation with other agencies and individuals. For the Clear Creek project, RHCAs are considered no-cut stream buffers and are excluded from harvest activities. RHCA widths that were established exceed State stream management zone requirements.

Forest Plan standards for water quality apply to this project, and compliance would be achieved via field reviews, effects analyses, project design features, and BMP implementation.

Table 3-35. Compliance with Nez Perce National Forest Plan Water Standards

Standard Number[a]	Subject Summary	Compliance Method
Nez Perce Forest Plan Standards		
1	Apply Idaho Water Quality Standards and BMPs.	Project design features and BMPs listed in Chapter 2
2	Utilize R1/R4 sediment yield and R1 water yield guidelines.	Effects analysis
3	Evaluate site-specific water quality effects.	Field reviews (conducted in 2011 and 2012). See project file for field notes and photos.
4	Complete watershed cumulative effects analysis.	A cumulative watershed effects analysis for Clear Creek Watershed was completed for this project.
8	Meet fish and water quality objectives in Forest Plan Appendix A (includes Forest Plan amendments 5, 11, and 26). Eight of 10 prescription watersheds have an upward trend requirement.	Project design criteria and BMPs listed in Chapter 2
Forest Plan Amendment 20 (PACFISH)		
WR-1	Promote ecological integrity through watershed restoration projects.	Project design criteria
WR-2	Cooperate with agencies, tribes, and private individuals.	Ongoing cooperation
WR-3	Prevent degradation (restoration is not a substitute for preventing degradation).	Project design criteria

[a] Standards 5, 6, and 7 do not apply within the context of this project.

3.11.2.2 Clean Water Act

The Clean Water Act stipulates that states are to adopt water quality standards. Included in these standards are provisions for identifying beneficial uses, establishing the status of beneficial uses, setting water quality criteria, and establishing BMPs to control nonpoint sources of pollution. EO 12088 also requires the Forest Service to meet the requirements of the Clean Water Act.

Section 313 of the Clean Water Act requires federal agencies to comply with all federal, state, interstate, and local requirements with respect to control and abatement of water pollution, and to cooperate with relevant processes and sanctions and administrative authority.

Section 303(d) of the Clean Water Act stipulates that states must identify and prioritize water bodies that are water quality limited (i.e., water bodies that do not meet water quality standards). For waters identified on this list, states must develop a total maximum daily load (TMDL) for the pollutants, set at a level to achieve water quality standards. No streams in the project area are listed for pollutants in the EPA-approved 303(d)/305(b) 2012 Integrated Report (IDEQ 2014).

Section 404 of the Clean Water Act requires permits to dredge or fill within waters of the United States. The U.S. Army Corps of Engineers administers these provisions. Culvert removal and replacement activities proposed under the Clear Creek project would require authorization under section 404, through application of either nationwide or site-specific permits.

3.11.2.3 Idaho Water Quality Standards

EPA regulations require each state to adopt an antidegradation policy as one component of its water quality standards. The objective of the Idaho Anti-degradation Policy is, at a minimum, to maintain and protect existing instream water uses and the level of water quality necessary to protect those uses (IDAPA 16.012501.01). Beneficial uses and water quality criteria and standards are identified in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02, IDAPA 37.03.02).

3.11.2.4 Idaho Forest Practices Act

This legislation regulates forest practices on all land ownership in Idaho. Forest practices on NFS lands must adhere to the rules pertaining to water quality (IDAPA 20.02.01). These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

3.11.2.5 Idaho Stream Channel Protection Act

This legislation regulates stream channel alterations between mean high water marks on perennial streams in Idaho. Instream activities on NFS lands must adhere to the rules pertaining to the Idaho Stream Channel Protection Act (IDAPA 37.03.07). These rules are also incorporated as BMPs in the Idaho Water Quality Standards.

3.11.2.6 Executive Orders 11988 and 11990

These orders provide for protection and management of floodplains and wetlands.

3.11.3 Resource Indicators

3.11.3.1 Water Quality and Quantity

The balance of water yield and sediment yield in a watershed influences the water quality/quantity of a stream system. Water yield refers to stream flow quantity and timing and is a function of water, soil, and vegetation interactions. Changes in amount or distribution of vegetation can affect water yield and ultimately alter stream channel conditions. Although there are no Federal, State of Idaho, or Forest Plan standards governing increases in water yield, there is general guidance on thresholds (NOAA 1998, Gerhardt 2000, USDA Forest Service 1973). Equivalent Clearcut Area (ECA) analysis is a tool used to correlate the relationship between water yield and the extent of forest canopy openings from fire, harvest, and roads.

Active erosion of the landscape yields sediment to streams and occurs naturally. When an excess of sediment—that is, over the natural (balanced) amount—is delivered to a stream, the stream's ability to route the sediment out of the system is diminished, and water quality is reduced. Harvest, temporary road construction, prescribed fire, and road-related activities have the potential to increase erosion production and sediment delivery into streams.

Roads influence both water quantity and quality. Roads concentrate surface water and are a source of sediment entering streams. Watershed road densities >3 miles per square mile (mi/mi^2) are categorized as low condition (i.e., poor conditions for watershed resources) (NOAA 1998).

Resource Indicators:

- Percent increase in ECA for HUC10 and HUC12 watersheds (compare to thresholds in NOAA 1998)
- Percent increase in ECA for Forest Plan Prescription watersheds (compare to guidance limiting increase in ECA to 20-25%, Gerhardt 2000)
- Percent increase in average annual water yield for HUC10 and Forest Plan Prescription watersheds
- Percent sediment yield increased over base (natural), as modeled by NEZSED (for HUC 10 and Forest Plan Prescription watersheds)
- Reduction in watershed road miles (HUC 5, HUC 6, Forest Plan Prescription watersheds

3.11.4 Analysis Methodology

The watershed analysis was completed at different scales based on designation of Strahler stream order. Stream order is a term used to characterize the branching of a drainage system. A first order stream is a perennial, mapable, unbranched tributary. A second order stream is formed when two unbranched first order channels join together, and continues as a second order stream until it meets another second order channel to become a third order channel, or enters a third order or higher channel as a side drainage. The term "headwaters" are often used to refer to first and second order streams. Forest

Plan prescription watersheds are generally 3rd to 5th order streams. USGS watersheds are part of the Watershed Boundary Dataset and the different levels are based on the number of digits in their Hydrologic Unit Code (HUC). This analysis will focus on the Clear Creek HUC10 and the three HUC12s: Upper Clear Creek, South Fork Clear Creek and Lower Clear Creek.

GIS-generated reports and maps, aerial photos, and field reviews were used to analyze effects to water quality and quantity from the Clear Creek proposed activities. Resource condition observations were conducted in the field during 2011 and 2012. Headwater channels, ephemeral swales, and springs/seeps in the proposed treatment units and downstream of them were examined and recorded on a map. Forest stand database (FSVeg) queries were conducted to identify past harvest activities and the time frame during which they occurred (see project file). Information from the Selway and Middle Fork Clearwater Rivers Subbasin Assessment (USDA Forest Service 2011a) and from the Clear Creek Watershed NFMA Assessment (2012) was used to develop the existing condition and cumulative effects evaluation.

Several analysis tools and models were utilized to calculate resource indicator values in in order to compare to threshold levels. Models were used to provide estimates, not absolutes, for comparison of alternatives.

Equivalent Clearcut Area (ECA) analysis is a tool used to index the relationship between vegetation condition and water yield from forested watersheds. The ECA model evaluates vegetation removal and the resulting potential changes to stream flow, timing, and water yield. The ECA analysis for this project utilized treatment and recovery coefficients from Ager and Clifton (2005) to determine existing and percent increase in ECA at the HUC10, HUC12, and Forest Plan Prescription watershed scales. Because harvest and burn history were not available for private or state lands, size and date of forest openings were determined using NAIP imagery in ArcGIS and Google Earth software.

The ECA model was developed in Region 1 of the Forest Service to analyze the effects of timber harvest and road construction on average annual water yield. The method was developed in the early 1970s by research scientists and several Region 1 Forest Service hydrologists and culminated in the publication *Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II* (USDA Forest Service 1973)**.** Early guidance for vegetation management recommended that ECA not exceed 20-25% in third to fifth order drainages (Silvey 1973). Stream orders for HUC10, HUC12, and Forest Plan Prescription watersheds are displayed in Table 3-36.

When the ECA model was developed and during the time that many paired watershed studies on clearcut harvesting were conducted, general forest practices included clearcutting with no retention trees; larger harvest units; distinct, linear unit edges; harvest right up to stream channels; higher severity slash removal burns (site prep); and different Best Management Practices than are used today.

Studies by Belt (1980) and King (1989) have served as field tests of the ECA procedure. Belt concluded that the ECA procedure is a rational tool for evaluation of hydrologic impacts of forest practices on third to fifth order drainages, which are typically similar in size or smaller than current HUC12 subwatersheds. King recommended local calibration of the model and a greater emphasis on conditions in first and second order headwater streams.

The Matrix of Pathways and Indicators of Watershed Condition for Chinook, Steelhead, and Bull Trout is an analysis tool adopted by federal agencies to describe the condition and function of many watershed processes (NOAA1998). ECA is one of several indicators used in the matrix. High quality habitat is associated with ECA of less than 15% in a HUC10 watershed and all internal HUC12 subwatersheds, moderate quality is associated with 15-20% ECA in HUC10 watersheds, with one or more internal HUC12 subwatersheds at 15-30% ECA, and low quality is associated with ECA of greater than 20% in a HUC10 watershed, with one or more internal HUC12 watersheds at greater than 30%.

Increases in average annual water yield for the HUC10 and Forest Plan prescription watersheds were calculated for Alternative C using formulas and graphs from *Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II* (USDA FS 1973).

A Rosgen classification was determined for each of the evaluated streams and sensitivity to disturbance ratings and associated recovery potential ratings were assigned (Rosgen 1994 and Rosgen and Silvey 1996). The streams were also evaluated using the Stream Reach Inventory and Channel Stability Evaluation Guide (USDA FS 1975, Pfankuch 1975). It was used to determine how resistant streams are to recent flow forces exerted on them and the capacity of streams to adjust and recover from potential changes in flow and/or increases in sediment production.

USGS StreamStats was utilized to compute ungagged stream flow information and stream reach information.

The Disturbed WEPP erosion model (Elliot et. al. 2000), and WEPP:Road (Elliot et al. 1999) were used to predict the level of erosion and sediment delivery produced from hypothetical “average” harvest, prescribed burning, temporary road construction and road improvement activities. The WEPP model is designed to predict sediment yield resulting from various forest management activities and the probability of sediment delivery, erosion, and runoff. The values obtained from the hypothetical “average” activities was used to determine the magnitude of difference between activities and incorporated into the upward trend analysis (Appendix J).

The NEZSED model was used to estimate the predicted percent increase in sediment yield over base (natural) conditions to determine if thresholds from Forest Plan Appendix A would be exceeded. The use of the model is a Forest Plan standard and is useful for comparing alternatives. The NEZSED model was derived from the R1/R4 Guide for Predicting Sediment Yields from Forested Watersheds (USDA Forest Service 1981). The methodology for using the NEZSED model and the model’s limitations are described in detail in the Forest’s guidance document, Implementation Guide to Appendix A of the Nez Perce National Forest Plan (Conroy and Thompson 2011). Sediment yield is calculated in tons per year and reported as “percent increase over base” conditions. Sediment yield is calculated for base conditions (without management activities), current conditions (cumulative of past and existing management activities combined with base conditions), and predicted conditions (cumulative of past, existing, and proposed activities combined with base conditions) for each of the proposed project alternatives. These percentages of sediment yield over base conditions are then compared to the sediment yield guidelines for prescription watersheds listed in Appendix A of the Forest Plan. Modeling was done on a peak year basis in order to meet the assumptions under which Appendix A of the Nez Perce Forest Plan was developed. It is highly unlikely, however, that all of the activities proposed would occur in a single year. Additional information about the models used in this analysis and limitations can be found in the project file.

3.11.5 Affected Environment

3.11.5.1 Watershed Descriptions

The Clear Creek project area (43,730 acres) is encompassed by the Clear Creek watershed (HUC 10), which flows into the Middle Fork Clearwater River. The 58,990-acre Clear Creek watershed contains three HUC 12 subwatersheds: Upper Clear Creek, South Fork Clear Creek, and Lower Clear Creek. These HUC 12 subwatersheds are divided into 10 Forest Plan prescription watersheds. Leitch Creek and Little Cedar Creek subwatersheds were not considered in the analysis, as they have no Forest Service ownership within them. The existing conditions of the watersheds are shown in Table 3-36. Watershed boundaries and stream locations are displayed in Figure 3-8 and Figure 3-9. No municipal water supplies or source waters are within, adjacent to, or downstream of the project area.

There are no Source Water Protection areas that extend into the Clear Creek project area, although the Source Water Protection area for the city of Orofino (PWS# 2180024 - City of Orofino) extends to main stem Clear Creek downstream of the project area (Clear Creek and Big Cedar Creek confluence). The IDEQ Source Water Assessment database was used to identify public water systems in Clearwater and Idaho counties that are located downstream of the Clear Creek project. Other than Orofino, all other public water systems including Kooska and Kamiah originate from wells. Surface Source Water Protection areas extend 25 miles upstream and 500 feet on each side of stream reaches. Implementation of BMPs, including the Idaho Forest Practices Act and Soil and Water Conservation Practices (FSH 2509.22) are sufficient to maintain water quality at the Orofino surface water intake and meet BMPs listed in *EPA Region 10 Source Water Protection Best Management Practices for USFS and BLM* (Draft October 12, 2005).

A search of water rights applications, permits, decrees, licenses, claims, and transfers was made for the areas located in the Clear Creek project area. Twenty water rights were identified: 19 for the U.S. Forest Service and 1 for the State of Idaho. Uses include minimum stream flow, stock water, and federal reserved use. Further details of each water right are located in the project file.

The proposed action alternatives analyzed for this project would not alter any existing water rights claims or decrease the available water relative to these claims.

Table 3-36. Existing Condition Information for Clear Creek Watersheds

Drainage	Stream Order[c]	Watershed Acres (100% Forest Service [FS] land unless indicated)	Percent of National Forest System Lands with Past Harvest (1956–2005) (%)	Road Density (miles/mile^2)[a]	Percent Equivalent Clearcut Area (ECA)[c] (%)
Clear Creek HUC10 1706030402	5	58,990 (72% FS)	26	2.7	4
Upper Clear Creek HUC12 170603040201	5	19,166 (97% FS)	36	3.1	3
Pine Knob Creek FP 170603040601	3	2,622	50	4.8	3
Browns Spring Creek FP 170603040610	3	3,057	40	4.1	3
Clear Creek[b] FP 170603040611	4	7,234 (91% FS)	31	2.3	3
Solo Creek FP 170603040612	3	2,226	51	3.5	3
Middle Fork Clear Creek FP 170603040613	4	4,025	26	2.4	2
South Fork Clear Creek HUC12 170603040202	4	16,478	14	1.8	1
Kay Creek FP 170603040614	3	3,537	13	2.5	2
South Fork Clear Creek FP 170603040615	4	12,941	14	1.6	1
Lower Clear Creek HUC12 170603040203	5	23,346 (33% FS)	40	3.0	6
Hoodoo Creek FP 170603040616	3	6,446	38	3.8	4
Big Cedar Creek[b] FP 170603040618	3	5,542 (13% FS)	70	4.6	10
Lower Clear Creek Face[b] FP 170603040619	5	11,358 (5% FS)	5	1.8	5

[a] Includes 10 miles of decommissioning under decision of 2011 South Fork/West Fork Clear Creek Road Decommissioning EA.
[b] ECA and road density calculations include privately owned land portions of the watershed.
[c] Stream orders are based on highest extent of streams as identified during field surveys in 2011 and 2012.

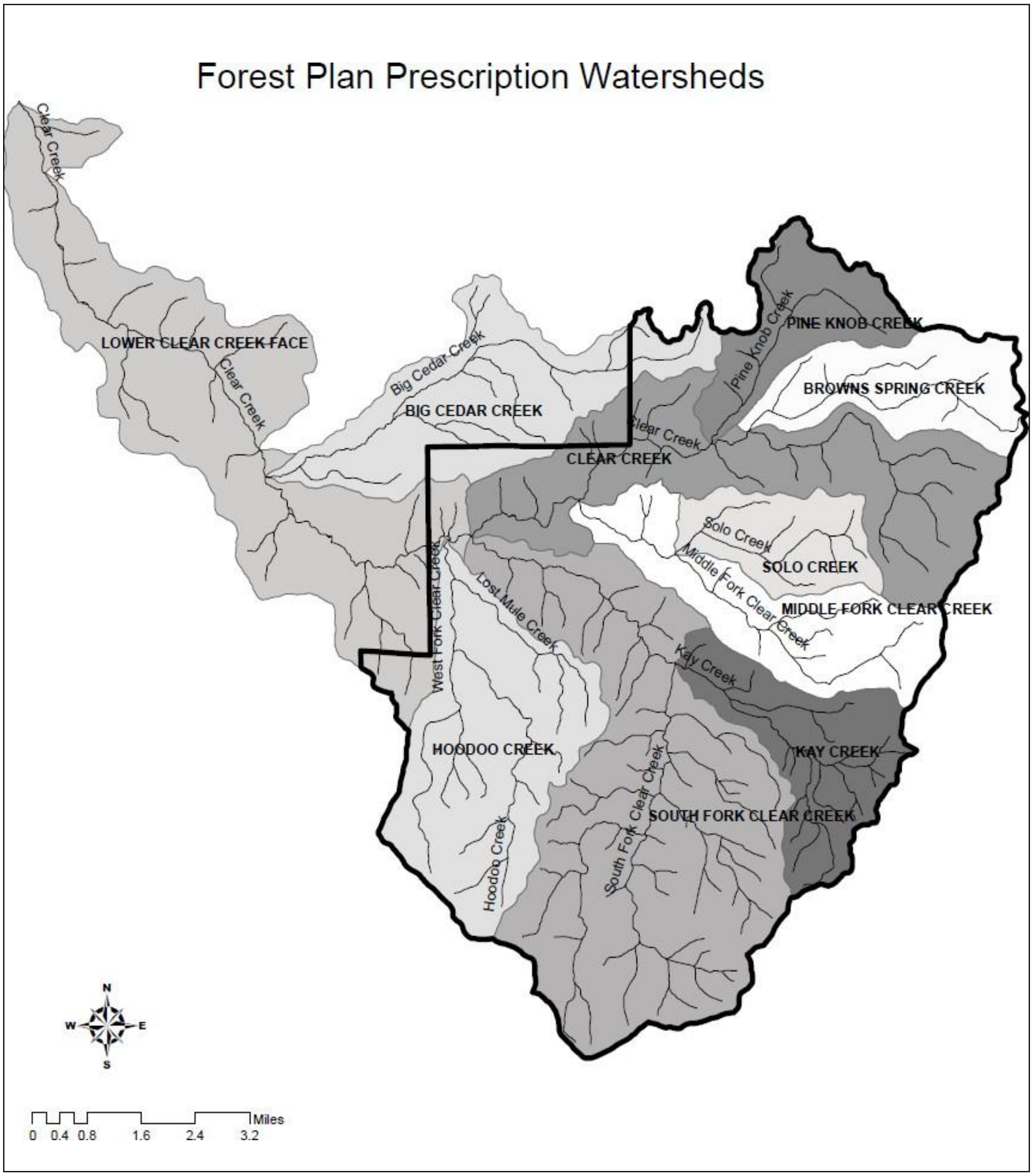


Figure 3-8. Forest Plan Prescription Watersheds and Major Streams in the Clear Creek Watershed

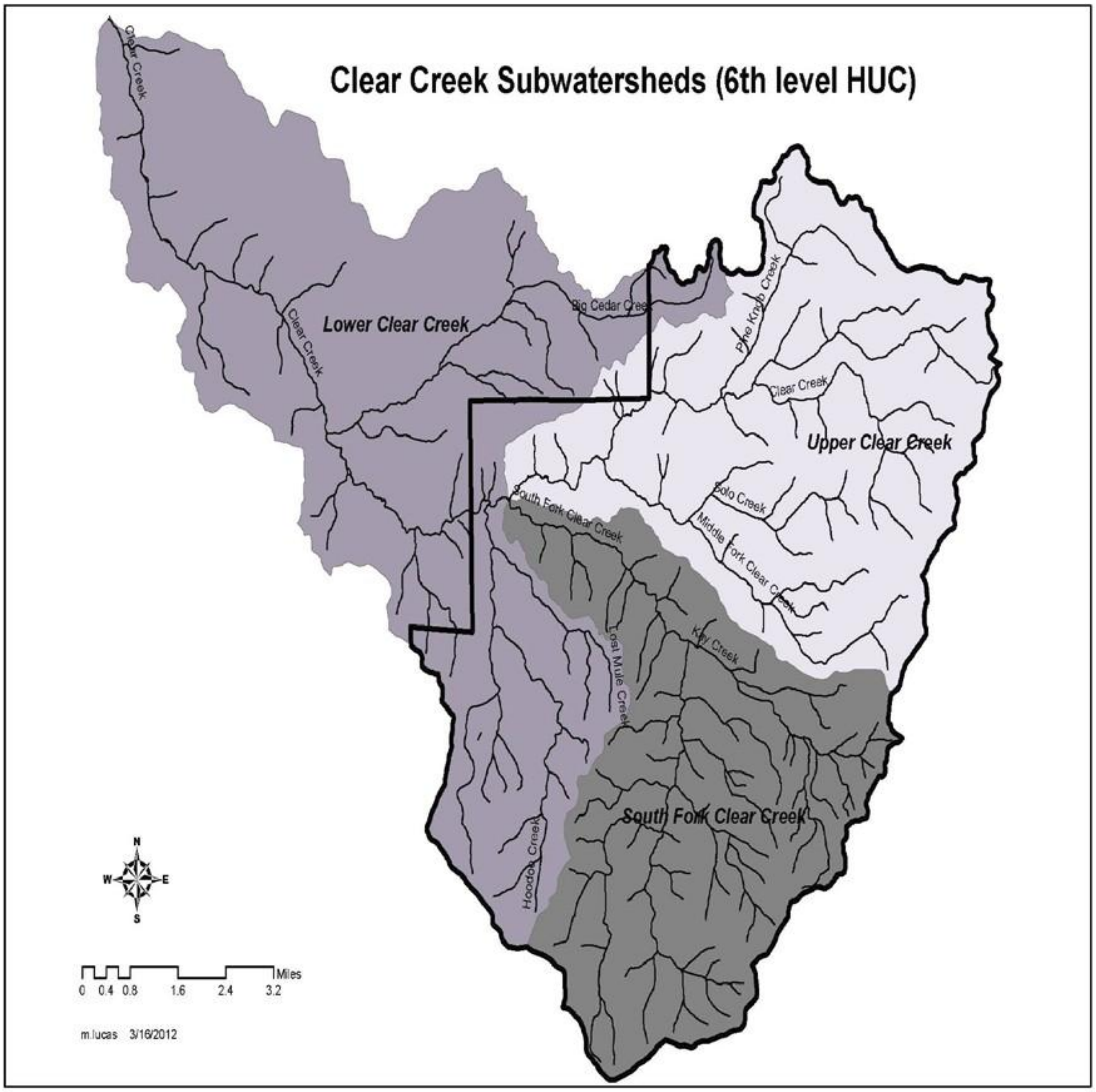


Figure 3-9. Clear Creek Subwatersheds (6th Level HUC)

Forested seeps and springs are found throughout the project area and often mark the upper extent of perennial flow. Stream channels range from headwater channels that are relatively steep and confined (Rosgen A) to lower-gradient Rosgen B and C channels (Rosgen and Silvey 1996).

Prior to project initiation, the Forest conducted a NFMA analysis (USDA Forest Service 2011a) for the Clear Creek Watershed tiered from the Middle Fork Clearwater Rivers Subbasin Assessment (USDA Forest Service 2001). Both the Subbasin and NFMA assessments identified departed conditions for terrestrial and aquatic habitats. Results were then used to inform and develop the purpose and need for the project. In addition, Nez Perce Forest Plan direction was also reviewed and used to identify prescription watersheds in the project area that did not meet fish/water quality objectives in 1987.

During the summers of 2011 and 2012, resource specialists evaluated conditions of headwater perennial and intermittent channels, ephemeral draws, and springs and seeps within and downstream of the proposed harvest units. Information collected included stream gradient, substrate configuration, bank condition, wetted, bankfull, and floodplain widths, erosion hazards (mass wasting/headcutting), road and culvert conditions at stream intersections, and determining if streams were in equilibrium in regards to cutting and deposition. Headwater channels in this area were found to be generally A3 and B3 channels (Rosgen and Silvey 1996) with well vegetated stream banks and stable substrates. Ephemeral draws showed no evidence of downcutting. In addition, temperature data and instream channel conditions of 3rd to 5th order streams were gathered (see aquatics section). During 2012 field reviews, bank cutting and deposition from 2011 runoff events were noted in Pine Knob and Browns Spring creeks. Comparison of stream conditions in nearby Selway and Middle Fork Clearwater drainages showed similar channel conditions and gage data indicated flows were higher than usual for the area.

Channels are primarily stable and not entrenched, and are fully accessible to their floodplains (which are generally less than 30 feet wide). Banks are stable, and channel substrate consists of silts and sands, gravels, cobbles and small boulders. Based on the indicators observed, most stream segments were considered to be in a stable condition, with balanced cutting and deposition (effectively storing and routing sediment). Aggradation (deposition of fine substrate) was noted upstream of several culverts, particularly culverts that were undersized or were at a flatter gradient than the stream channel. Some stream bank damage was noted in isolated locations where livestock crossed streams or at watering locations. Most of the disturbance occurred on closed roads where roads bisected streams.

Additionally, road and culvert related concerns were identified in the field and prioritized for repair. Some of these items were addressed under separate NEPA decision documents and were incorporated into the existing condition of the EIS or the cumulative effects analyses as a future project. Although assessed during the same pre-NEPA assessment as this EIS, it was determined that implementing these projects through separate NEPA and prior to the completion of this EIS would accelerate watershed recovery. For example the stream adjacent 650D road complex was included in the South Fork/West Fork Clear Creek Road Decommissioning Project EA (2011) and approximately 2.0 miles of road along Hoodoo Creek was decommissioned (see Appendix J).

A stream stability evaluation was conducted for the 48 stream reaches reviewed in the field to determine how resistant streams were to recent flow forces exerted on them (USDA FS 1975). The evaluation also helps predict the resistive capacity of streams to detachment of bed and bank materials due to changes in flow and/or increases in sediment production, as well as assessing the ability of channels to adjust and recover from those changes (USDA FS 1975). Fifteen indicators are evaluated and scored a certain value. A final score is achieved by adding the fifteen values. Scores range from 38 to 152. An “Excellent” score is 38 and all 15 indicators have to rate as excellent to obtain this rating. A score of “Good” ranges between 39 to 76, “Fair” ranges between 77 to 114, and a >115 is a “Poor” rating. A stream channel reach that rates “poor” has a combination of attributes that would require more judicious upstream management of forest lands than one rated “excellent”. Rapid changes in the density and aerial extent of vegetation on a watershed can increase stream discharges. Channel systems rated “excellent” can withstand these increases with less damage than systems rated “poor”. Most of the streams inventoried rated as Good and would be able to withstand some level of increased stream flows. One of the indicators for upper banks is landform slope and to achieve an excellent rating, bank slope must be <30%. For most of the “V” shaped first and second order streams associated with this project area, bank slopes are generally greater than 30%, making it difficult to achieve an excellent score. (see project file for individual stream reach ratings, photos, and map).

A Rosgen classification was also determined for each of the evaluated streams and sensitivity to disturbance ratings and associated recovery potential ratings were assigned (Rosgen 1994 and Rosgen and Silvey 1996). For the A2 and B3/4 channel types, there is a low to moderate sensitivity to disturbance (includes increases in streamflow magnitude and timing and/or sediment increases) and recovery potential is excellent. The A3/4 channel types are more sensitive to disturbance with a rating of very high to extreme and a very poor recovery potential. These sensitivity parameters were originally designed for livestock grazing management but are still useful in demonstrating that headwater channels in the project area may be more sensitive to disturbance than the larger B channels.

Beneficial uses and water quality criteria and standards are identified in the Idaho Water Quality Standards and Wastewater Treatment Requirements (IDAPA 58.01.02). Designated Beneficial Uses (IDAPA 58.01.02, Section 120) for the Middle Fork Clearwater River Subbasin are cold water biota, salmonid spawning, domestic water supply, and primary contact recreation. Designated Beneficial Uses for Pine Knob Creek, Browns Spring Creek, and Clear Creek (mainstem) are cold water biota, secondary contact recreation, and salmonid spawning. The Idaho Department of Environmental Quality (IDEQ) has determined that the streams are fully supporting those beneficial uses (IDEQ 2012 Integrated Report 2014). For those streams not individually listed (undesignated surface waters), beneficial uses include cold water biota and secondary contact recreation. Solo Creek and Middle Fork Clear Creek were found to be fully supporting these beneficial uses, while Kay Creek, South Fork Clear Creek, Hoodoo Creek, and Big Cedar Creek have not been assessed.

The IDEQ direction is to improve or maintain water quality conditions in order to support beneficial uses. No streams within the Clear Creek drainage are listed for impairment by pollutants in the EPA-approved 2012 IDEQ 303(d)/305(b) Integrated Report (IDEQ 2014).

Conditions in the Clear Creek project area are a result of both natural processes and human activities. Past human-related activities include recreation, fire suppression, road building and maintenance, and harvest activities (1950s–2000s). Past harvest and associated road construction have had the most impact, with some increases in water yield and sediment yield. Harvest activities from 1950s to 2005 have occurred on 5%–70% of the Forest Service owned portions of the prescription watersheds in the Clear Creek project area.

The morphology of stream channels (width, depth, slope, substrate, etc.) is the result of the balance between the timing and amount of water yield and the amount of sediment yield, deposition, and transport. If changes occur in the amount of sediment or magnitude of peak flows, the shift in the balance between water yield and sediment yield can lead to changes in channel morphology. For instance, an increase in water yield without an increase in sediment yield may lead to scouring the stream bed and the channel down-cutting, and conversely, increases in sediment yield without an increase in water yield can lead to excessive deposition of sediment in the stream channel. The stream system is a connected network, and therefore changes in the physical processes upstream have effects in downstream reaction in channels.

3.11.5.1.1 Water Yield

Compaction, disturbance, or removal of the ground surface and disturbance or removal of vegetation can alter water yield.

Water yield refers to the volume and timing of stream flow at a given point. In the absence of major disturbance, a stream channel is typically dynamically in balance with its flow regime, which is a key determinant of the energy available for erosion, transport, and deposition of sediment within channels. Increased water yields may be associated with increased probability of peak flow events, which could lead to increased channel and bank adjustment through scour, bedload movement, or redistribution of sediment in depositional areas.

Water yield can increase after loss of mature trees (e.g. through harvest or wildfire) due to a reduction in transpiration and precipitation interception losses. Removal of forest canopy can also affect snow accumulation and melt processes, often resulting in an increase in snowpack accumulation and melt rates, which can lead to altered timing of peak snowmelt runoff, depending on the size, orientation and total area of clearcuts in a given drainage (Storck et al. 2002, Winkler et al. 2005). The presence of roads and skid trails typically increases overland flow due to soil compaction; these impacts are similar to those of canopy removal from timber harvest. ECA is often used as an indicator of potential changes in water yield and represents the amount of forest canopy openings in the watershed. Existing roads are considered permanent openings in ECA estimates. Lower ECAs generally indicate a higher likelihood that stream channels are in balance with their flow regime.

There are no Federal or State of Idaho standards govern changes in peak flow or water yield. The Forest Plan calls for maintaining the stability, equilibrium, and function of all streams on the forest, but does not specify a threshold for ECA or increase in water yield. The plan does require that water yield not increase beyond acceptable limits. This guidance was subsequently refined to state that water yield analysis should be done where vegetation removal occurred over a high proportion of a watershed area. High proportion was recognized to vary with watershed and climatic characteristics, but was generally considered to occur when ECA exceeded 25-30% (Gerhardt, 1991). Early Forest guidance for vegetation management recommended that ECA not exceed 20-25% in third to fifth order drainages (Silvey 1973). ECA is also used as an indicator in ESA consultation for habitat condition. An ECA of <15% at the HUC10 and HUC12 scales are associated with high quality habitat (NOAA 1998).

An ECA analysis was conducted to determine the existing ECA condition. Past harvest, wildfire, and roads were included in the analysis and included roads and forested openings on private and state lands. Existing ECAs at the HUC12 scale range from 1% to 6% (Table 3-38). Each of the subwatersheds is considered in high (good) condition of <15% ECA (NOAA 1998). Existing ECAs in the Forest Plan prescription watersheds ranged between 1% and 10% (Table 3-38) and are below the recommended threshold of 20 to 25% for 3rd to 5th order streams (Gerhardt 2000).

3.11.5.1.2 Sediment Yield

Active erosion of the landscape yields sediment to streams and occurs naturally or as the result of management activities. When an excess of sediment—that is, over the natural (balanced) amount—is delivered to a stream, the stream's ability to route the sediment out of the system is diminished, and water quality is reduced.

Prescription watersheds were assigned fish/water quality objectives in Appendix A of the Forest Plan. These objectives provide management direction in terms of the maximum estimated increase in sediment over baseline conditions that can be approached or equaled for a specific number of years per decade. In 1987, the eight Forest Plan prescription watersheds with assigned objectives did not meet their fish/water quality objectives, and sediment was the primary limiting factor. These same watersheds have an Upward Trend Requirement, which allows timber management to occur, concurrent with improvement efforts, as long as a positive, upward trend in habitat carrying capacity is indicated. Objectives for Big Cedar Creek and Lower Clear Creek Face were not designated, nor were sediment yield guidelines assigned. The sediment yield guidelines (the maximum sediment yield allowable to meet fish/water quality objectives) for each watershed are shown in Table 3-40. Appendix A of the Forest Plan also assigned entry frequency guidelines for each of the watersheds. Few activities have occurred in any of the watersheds in the past 10 years to qualify as an entry, when considering sediment production. The most recent harvest was the Middle Fork timber sale in the Pine Knob Creek drainage in 2005.

Roads are a source of sediment to streams, particularly at culvert inlets where cutslope slumping occurs and on roads in need of more drainage structures. Road densities within the prescription watersheds range from 1.6 to 4.8 mi/mi^2. A watershed in high (good) condition generally has a road density of <1 mi/mi^2. Watersheds with 1–3 mi/mi^2 are rated as moderate, and those with >3 mi/mi^2 are rated as low (poor) condition (NOAA 1998). Of the 10 Forest Plan prescription watersheds, 5 are rated as moderate condition, and 5 are rated as low condition. The baseline road miles for this project include the 10 miles of road decommissioning that occurred under the South Fork/West Fork Clear Creek Road Decommissioning 2011 decision.

3.11.6 Environmental Consequences

3.11.6.1 Direct and Indirect Effects

Due to the scale of resource indicator guidance thresholds, direct and indirect effects areas are the three HUC 12 subwatersheds and the 10 Forest Plan prescription watersheds. In addition, headwater streams (first and second order) were also evaluated, as these areas represent the lowest level at which effects would be detected.

3.11.6.1.1 Alternative A—No Action

Under this alternative, no proposed management actions would occur. Actions occurring on state and private lands would continue. Because no vegetation removal or ground-disturbing activities would occur, no direct effects would result from this alternative. Under Alternative A, road density and road-related erosion (indirect effects) would remain unchanged. Benefits from the reconditioning, reconstruction, and decommissioning of roads, proposed as part of the action alternatives, would not be attained. These roads would continue to be a potential source of sediment and would continue to intercept water and reroute it to stream systems.

Forested stands would continue to decline due to insect and disease and lack of regenerating disturbance. Maintenance and re-establishment of long-lived, early seral species would not occur. Risk of large scale, stand replacing fire would increase over time, although the timing, size, or severity of such an event cannot be predicted. Increase in ECA for this scenario was not estimated due to unpredictability of extent of mortality from insect and disease or future wildland fires, but ECA could exceed levels estimated from the action alternatives.

Alternative A does not propose any new activities that would directly or indirectly affect wetlands or floodplains or increase water temperatures.

3.11.6.1.2 Alternatives B, C, and D—Action Alternatives

3.11.6.2 Regeneration, Improvement, and Commercial Thinning

Alternative B proposes 2,609 acres of regeneration, 5,606 acres of commercial thinning, and 331 acres of improvement. Alternative C proposes 4,156 acres of regeneration, 4,220 acres of commercial thinning, and 331 acres of improvement. Alternative D proposes 2,178 acres of regeneration, 5,141 acres of commercial thinning, and 211 acres of improvement. The vegetation treatments would maintain or reestablish long-lived, early seral species and would create a healthier, more resilient landscape better able to survive natural disturbances. Table 3-37 displays vegetation removal activities by alternative for the three HUC12 subwatersheds. The most harvest occurs under Alternative C, followed by Alternative B, and then D. Harvest activities were assessed using ECA, increases in percent water yield, and the NEZSED model (sediment yield).

Table 3-37. Vegetation Removal Activities (Acres) for Each Alternative (Alt.), by HUC12

Subwatershed (HUC12)	Upper Clear Creek 170603040201			South Fork Clear Creek 170603040202			Lower Clear Creek 170603040203		
	Alt. B	Alt. C	Alt. D	Alt. B	Alt. C	Alt. D	Alt. B	Alt. C	Alt. D
Regeneration	1,209	1,486	993	698	868	518	700	1,798	667
Commercial thin	2,774	2,625	2,699	883	714	719	1,946	880	1,720
Improvement	227	227	140	0	0	0	97	98	65
Temporary roads outside units	9.1	9.1	5.2	3.5	3.5	2.9	5.7	5.7	1.9
Prescribed burn	601	601	601	326	326	326	445	445	445

Note: Does not include precommercial thinning

3.11.6.2.1 Water Yield

The effects of vegetative manipulation on water yield are complex, highly variable, and depend on many independent factors such as elevation, climate, aspect, and especially precipitation. Removal of vegetation has the potential to increase stream flow in the short term (0–10 years) due to changes in evaporation, precipitation, wind patterns, and soil infiltration and percolation (Fowler et al. 1987; Dunne and Leopold 1978).

In studies summarized by Grant et al. (2008), detectable increases in peak flow (10%) generally occur when more than 20% of a watershed (<10 km^2 drainages) is harvested. Clearcut harvest prescriptions were the primary focus of those studies. Increase in stream flow is generally not measurable until at least 20 to 30% of a watershed’s forest cover is removed (MacDonald and Stednick 2003). Stednick (1996) suggests that flow changes are not measurable when <25% of the watershed is clearcut. Conclusions from the studies are mostly base on research in small tributary watersheds (approximately 200 acres, but Troendle et al. (2001) found that the hydrologic effects of forest management on a 6.5 mi2 basin were directly comparable to the results from much smaller basins. At Coon Creek in south-central Wyoming there was a detectable change in annual water yield as a result of harvest and road-building on 24% of the watershed (Troendle et al. 2001). The size of the study area was 6.5 mi^2 (approximately 4,000 acres) and roughly the equivalent of the Forest Plan prescription watersheds. Changes in runoff measured on small experimental basins can be scaled up to much larger basins (MacDonald and Stednick 2003). A review of paired catchment experiments concluded that at least 15-20% of a forested basin must be treated within a short time period in order to detect a change in runoff (Bosch and Hewlett 1982). Troendle and Leaf (1980) noted that 20-30% of a watershed must be treated to detect a statistically significant change in flow. Recommendation in USDA Forest Service (1970) suggested not clearcutting more than 25 to 30 percent of a 3rd order drainage area to stay below a 8-10% increase in average annual water yield (recommended threshold).

As shown in Table 3-38, regeneration harvest activities would occur on 1% to 22% of the Prescription watersheds (Alt. C only). Proposed regeneration harvest accounts for <8% of any of the HUC12 subwatersheds.

The effect of thinning overstocked stands on water yield is usually minor, and hydrologic recovery can occur within 5 years (USDA Forest Service 1973). Analysis of water yield is probably not necessary for treatments that remove 20% or less of basal area, because the effects are not likely measurable (Troendle et al. 2009). Effects of thinning, fuel treatments, and partial cuts on water yield are likely to be short-lived and may not even be measurable (Troendle et al. 2009).

ECA is used as an indicator of change in water yield resulting from reductions in forest canopy. The ECA analysis takes into account the initial percentage of crown removal and the recovery through vegetative regrowth since the initial disturbance. Existing roads are considered permanent openings in ECA estimates. The analysis takes a simple snapshot in time, with the assumption that all Clear Creek project activities would be implemented in 1 year. ECA predictions are used to compare alternatives and are not viewed as absolutes. This water yield indicator serves only as a red flag that suggests a potential for decreased stability due to sustained increased energy in the stream channel. ECA is used in combination with other indicators such as channel stability and channel type to determine hydrologic risk.

The ECA method was developed to address concerns regarding water yield increases and potential effects on channel morphology. In the 1970s and 1980s, channel impacts (primarily scouring) were often observed, and these impacts were thought to be caused by water yield increases. During that period, clear-cutting was common, timber harvest levels were substantially higher, and impacts to streams were common. Forest management practices have changed dramatically since that time. Streams now have no-harvest buffers of 100–300 feet on both sides of the watercourse, and BMPs are implemented on all projects. These changes have greatly reduced the impacts of forest management on stream channels and aquatic habitat.

ECA was calculated at two scales: 1) the HUC12 scale in order to compare to the thresholds in The Matrix of Pathways and Indicators of Watershed Condition for Chinook, Steelhead, and Bull Trout (NOAA 1998) and 2) the Forest Plan prescription watershed scale to compare to guidance limiting ECA to 20 to 25% for 3^{rd} to 5^{th} order streams (Gerhardt 2000).

ECA at HUC12 subwatershed scale

A lower ECA values corresponds to a lower likelihood that undesirable effects of increased water yield (e.g. elevated channel and bank scour) would occur. An ECA value of less than 15 percent is unlikely to result in measurable change in water yield, a condition rated as “high” or healthy by NOAA Fisheries (1998). At the HUC12 scale, ECAs of <15% indicate high (good) condition. ECAs of 15%–30% indicate moderate condition and ECAs of >30% are considered low (poor) condition (NOAA 1998). The estimated percent increase in ECA from harvest activities, temporary road construction, and prescribed burning ranges from 5% to 13%, depending on watershed and alternative (Table 3-40). When these increases are added to the existing ECAs, they produce ECA estimates that predict what watershed conditions would be like after the Clear Creek project. These ECA estimates range from 7% to 15% for Alternative B, 8% to 16% for

Alternative C, and 6% to 14% for Alternative D. The highest increases in ECA occur under Alternative C, followed by Alternative B, then D.

For the Upper Clear Creek HUC 12 subwatershed, watershed condition would move from high (good) condition to a moderate condition for Alternatives B and C, but would remain in good condition for Alternative D. South Fork Clear Creek subwatershed would remain in good condition for the ECA indicator for all alternatives. For the Lower Clear Creek subwatershed, watershed condition would move from a good to moderate condition for Alternative C, but would remain good for Alternatives B and D. Although two subwatersheds would change from a good to moderate condition, the percent ECAs are on the low end of values within the moderate category.

Table 3-38. Estimated Percent Increase in Equivalent Clearcut Area (ECA) from Project Activities (Huc 12) for Modeled Year 2015, by Alternative (Alt.)

HUC 12 Subwatershed	Existing ECA[a]	Estimated Increase in Percent ECA from Project Activities			Final Percent ECA (Existing plus Project)		
	Alt. A	Alt. B	Alt. C	Alt. D	Alt. B	Alt. C	Alt. D
Upper Clear Creek	3	12	13	11	15	16	14
South Fork Clear Creek	1	6	7	5	7	8	6
Lower Clear Creek	6	7	9	6	13	15	12

[a]ECA calculations include privately owned land portions of the watershed.

Note: Vegetation removal activities include prescribed burning, regeneration, commercial thinning (but not precommercial thinning), improvement, and construction of temporary roads. Numbers are rounded up or down to the nearest whole number.

ECA at Forest Plan prescription watershed scale

As suggested in Belt (1980), ECA calculations were originally proposed for third to fifth order stream drainages. Early guidance suggested ECAs not exceed 20 to 25% in 3rd to 5th order drainages (Gerhardt 2000). Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II (USDA FS 1973) describes that most 3rd through 5th order drainage channels on the Nez Perce National Forest can sustain a 10% increase in average annual runoff as a result of timber harvest before increases are detectable. Using calculations and graphs documented in Forest Hydrology, Part II (USDA FS 1973), it was determined that for an average 5,000 foot elevation (range of 3,500 to 6,000 feet), a limitation of10% increase in average annual runoff, and a water yield increase factor of 40% (F factor), an allowable ECA for these drainages equate to 25% (ranges between 22% to 29% depending on elevation).

Final ECAs for the Forest Plan prescription watersheds range from 3% to 20% for Alternative B, 3% to 26% for Alternative C, and from 2% to 19% for Alternative D. The highest increases in ECA occur under Alternative C, followed by Alternative B, then D (Table 3-39).

Table 3-39. Estimated Percent Increase in Equivalent Clearcut Area (ECA) from Project Activities in Forest Plan Prescription watersheds for Modeled Year 2016, Percent of Regeneration Harvest, and Percent Increase in Average Annual Water Yield by Alternative (Alt.)

Forest Plan Prescription Watershed	Existing ECA[a]	Final Percent ECA (Existing plus Project)			Percent of watershed with proposed Regen Harvest (Alt. C)	Percent increase in average annual water yield* (Alt. C)
	Alt. A	Alt. B	Alt. C	Alt. D		
Pine Knob Creek	3	14	14	14	4%	5%
Browns Spring Creek	3	19	19	17	9%	8%
Clear Creek	3	15	15	12	7%	6%
Solo Creek	3	16	19	18	17%	8%
Middle Fork Clear Creek	2	7	9	7	5%	<5%
Kay Creek	2	3	3	2	2%	<5%
South Fork Clear Creek	1	8	9	7	6%	<5%
Hoodoo Creek	4	20	26	19	22%	10%
Big Cedar Creek	10	14	15	13	5%	6%
Lower Clear Creek Face	5	6	6	6	1%	<5%

*Formulas, assumptions and calculations can be found in the project file.

Estimated final ECAs were highest in the Hoodoo, Browns Spring, and Solo Creek watersheds, but are within the range of recommend allowances. As stated above, these ECA estimates are based on the assumption that all project activities would occur in 1 year. In reality, these activities would be staggered over several years. For example, this project could be broken up into seven different timber sales and harvested over a seven-year period. Units in Browns Spring and Solo Creek areas (Upper Clear Creek) would be split out into two to three timber sales and harvested at different time periods. The same would be done for those units in the Hoodoo and West Fork Clear Creek areas (Lower Clear Creek).

Additionally, increases in average annual water yield for each of the Forest Plan prescription watersheds were calculated for Alternative C using formulas and graphs from *Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II* (USDA FS 1973). Isaacson (1977) concluded that when average annual flows are exceeded by more than 10 percent channel damage could begin to occur. Most 3rd through 5th order drainage channels on the Nez Perce National Forest can sustain a 10% increase in average annual runoff as a result of timber harvest before increases are detectable (USDA Forest Service 1973). Other guidance documents (USDA Forest Service 1970) indicated that when the average annual water yield is increased by 8-10%, stream channel damage (aggradation-degradation) could be initiated. The potential for alteration develops during the spring runoff period. The degree of change or rate at which it occurs is dependent upon the degree of stream channel stability that presently exists and the type of stream channel that would carry the increase yield. Increases in water yield from the proposed activities were estimated to be 10% or less for the Forest Plan prescription watersheds (Table 3-39) which are predicted to be below detectable limits. Increases over the recommended 10% increase in average annual water yield are generally allowed when stream banks are more than 60% stable. As stated above, most of the streams reviewed in the field were in a stable condition with Phankuch ratings of Good.

Morphologic and hydrologic condition on third order or larger streams may minimize their vulnerability to harvest-related flow increases. The morphology of most third order and larger stream bottoms tend to minimize the scour of increased flows (Rainville 1987). Stream channels naturally experience bank full flows about once every two years (Leopold et al. 1964). Flows that exceed the channel capacity flood into the riparian zone. This reduces the erosion potential of peaks because the water flows over a much wider area and over energy reducing vegetation and wood. For flood flows to cause significant channel scour, they would have to be large enough to overcome this energy dissipating system. If canopy removal affects only small to moderate sized peaks and generally results in less than a 20% increase in water yield, the increase in flow may be insufficient to overcome the energy absorbing affect (Rainville 1987).

Much research has been conducted on harvest activities and the potential for increased water yield. Most of the studies conclude that removal of forest vegetation increases water yield to some extent, but there is much variability in conclusions (summarized in Grant et al. 2008, Bosch and Hewlett, 1982; Stednick, 1996, MacDonald and Stednick 2003). The broad variation in findings suggests that one or more studies can be found to support nearly any point of view. Several of the earlier studies regarding harvest and increased water yields analyzed paired watersheds—one watershed with no harvest as the control and another usually 100% clear cut (summarized in Stednick 1996 and Bosch and Hewlett 1982). Forest practices in these studies included cutting up to the stream channels and hot, broadcast burning of slash. Newer practices include retention of large green trees, snags, and downed wood material, utilization of Riparian Habitat Conservation Area no cut buffers, less ground disturbing logging systems, and less intense slash reduction methods.

Many of these studies looked at clearcut activities in areas with openings of >2–5 tree heights distributed over a substantial portion of a watershed (Kendall 1999, Troendle and King 1987, Winkler et al. 2005). The mechanism for altering flows is largely from two sources: reduced evapotranspiration rates following vegetation removal and altered rates and patterns of snow accumulation and melt (Grant et al. 2008). The rate of snowmelt depends upon many factors such as the silvicultural treatment, size of openings, aspect, and climate. Increased exposure of snow packs to solar radiation and thermal radiation from surrounding trees or stands, melts snow faster and earlier in the spring (Troendle 1983), which can result in increased water yields and peak flows. A substantial portion of a watershed would have to be effectively treated to cause a significant change in the timing and magnitude of snowmelt (Kendall 1999). In general, maximum snow retention occurs in clearings of approximately 5 tree heights in diameter (approximately 500 to 600 feet) (USDA Forest Service 1973). Although studies have shown localized increases in snow accumulation, they found no statistically significant change in mean snow water equivalent over the entire watershed as a result of clear-cut openings (Troendle 1983). The increases in snow water equivalent found in clearings were balanced by losses from adjacent forested areas. Clear-cuts that are small enough to be shaded by nearby forest (1 to 3 tree heights) will melt later and may not contribute to streamflow at all (MacDonald 1989).

Proposed variable tree retention levels of 14–28 trees per acre for this project would be left as singles or clumps depending on the locations of the larger legacy trees and species wanted for retention and could look similar to Figure 3-10. No cut riparian buffers would also provide retention areas within and adjacent to regeneration harvest units. Snow accumulations would occur in the smaller openings between clumps within the regeneration harvest units, but larger accumulations are not expected, due to design criteria limiting openings to 2 acres in size without leave tree retention.

Figure 3-10. Variable Retention Example from the Nez Perce-Clearwater National Forest

The magnitude of any peak flow increase in response to forest management diminishes with increasing basin area for several reasons, including attenuation of flood peaks because of channel resistance, flood-plain storage, and transmission losses, as well as effects of storm size and origin (Archer 1989, Garbrecht 1991, Shaman et al. 2004, Singh 1997, Grant et al. 2008, Macdonald and Stednick 2003).

No hydrologic mechanism exists by which peak flow increases, when measured as a percentage change, can combine to yield a higher percentage increase in peak flows in a larger basin. As a consequence, the magnitude of peak flow increases for larger basins will necessarily be equal to or smaller than those reported for small watersheds. (Grant et al. 2008). Some factors affecting timing and amount of runoff include: variability of snow accumulation, timing of snow melt due to aspect and elevation, amount of available water storage in the soil, and underlying parent material. King's studies (1994) conducted on the Nez Perce National Forest showed that while there was evidence of peak flow increases in the headwater first and second order streams, they were cumulatively not detectable on the main stem (third order). The larger the drainage area, the less likely synchronization of flows will occur due to the greater opportunity for storage (Megahan 1972). Most stream channels experience bank full flows about once every 2 years. Flows which exceed the channel capacity flood into the riparian zone, which reduces the erosion potential of peaks by flowing over a larger area containing vegetation, trees, and other obstructions.

Water yield changes resulting from timber harvest in the northern Rockies typically includes an advance in the timing of the rising limb of the snowmelt hydrograph and an increase in the total volume of runoff. Changes were most evident in the first 10 years after harvest (Hicks et al. 1991, Jones 2000. Even where rain-on-snow is an issue, the biggest effect on smaller peak flows is at recurrence interval (RI) less than one year (i .e., lower than the bankfull event) (Harr 1976, Harr 1986, Zeimer 1998). Larger flows tend to be dominated by the rainfall component of the storm, and the snowmelt component has little influence on the flood size. Increases in runoff following forest harvest are substantially greater in wet years than in dry years (MacDonald and Stednick 2003). Early studies, such as Wagon Wheel Gap (1928) and Fools Creek (1969), demonstrated that in areas where the majority of precipitation is in the form of snow, increase in water yield occurred primarily during the snow melt runoff season. Although water yield increases of 16% and 25% were noted in these studies, both reported that no damage to channels occurred nor was sediment increased significantly (USDA Forest Service 1973). Utilizing predictions from Bosch and Hewlett (1982) there would be an approximate 20% increase in water yield if 50% of forest vegetation was removed in small tributary drainages (study areas were about 50-300 acres in size). This calculation is based on a 40 mm increase in water yield per 10% change in cover and a mean annual precipitation for the project area of 1100 mm. Research in the nearby Horse Creek watershed study area (Nez Perce National Forest) demonstrated instantaneous peak flow increases of up to 34 percent and maximum monthly flow increases up to 44 percent, resulting from road construction and timber harvest (patch clearcutting) in small catchments (King, 1989). The East and Main forks of Horse Creek are third order streams with watersheds of approximately 4,000 acres. The Horse Creek study watersheds were first and second order drainages ranging between 60 and 380 acres in size. Although there were increases in stream flows noted at the smaller tributary watersheds, there was no detectable change in any stream flow parameters at the Main Fork Horse Creek gage station (King 1989).

For first order drainages, approximately 50 percent (range 40 to 60 percent) of a drainage could be regeneration harvested (utilizing variable tree retention with approximately 20% tree retention, including no-cut buffers) and still fall within the approximately 40% PECA (range 20 to 60%) allowable in first order drainages before increases in water yield exceed 10% (Benoit 1973). This estimate is for first and second order drainages (generally 50 to 300 acres in size) with elevations of 3,500 to 5,500 feet and with stream channels of Good condition. The Probable Equivalent Clearcut Area (PECA) was originally created for the Clearwater National Forest. Additionally, guidance in *Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II* (USDA Forest Service 1973) recommends a 50% maximum area in clearcut condition for second order streams and 70% for first order streams.

There are some first and second order stream drainages within the project area that have 50% or more proposed regeneration harvest treatment within their drainages. These regeneration treatment areas include portions of Units 102, 103, 109 (Clear Creek drainage); 126,128,129, 229, 230, 234 (West Fork Clear Creek drainage); 139, 142, 224, 226 (South Fork Clear Creek drainage) and 145 (Kay Creek drainage). Generally, a 20% reduction in unit acres occurs due to additional wetlands and streams being located during marking of unit boundaries in the field. These areas receive no-cut harvest buffers. Also any additional landslide prone areas identified during unit boundary layout and marking of trees are dropped and protected with no-cut harvest buffers.

Most of the first and second order streams in the within and adjacent to harvest units are greater than 10% gradient, with gravel/cobble substrates, and have small average annual water yields and peak flows. For example a tributary to Clear Creek (located between Units 102 and 103) with a drainage area of 320 acres, has a stream gradient of over 10%, cobble substrate, an average annual flow 0.4 cubic feet per second (cfs), and a bankfull peak flow of 5.5 cfs. Clear Creek at that point has an annual flow of 20 cfs and bankfull flow (peak1.5) of 130 cfs. Third to fifth order streams downstream of harvest units range between 4 and 10%. As discussed in Grant et al. (2008) peak flow effects on channel morphology are generally limited to stream reaches where channel gradients are less than approximately 2% and in which streambeds are composed of gravel and finer substrate material. There are very few areas in the Clear Creek project area with these characteristics (see stream evaluation field notes in the project file. There are short sections (100-500 feet in length) in the third to fifth order streams that have a <2% gradient, but sections have predominantly cobble sized substrate. Longer sections of <2% gradient occur in main stem Clear Creek (300 to 2500 feet in length) on Forest Service land and downstream of the project area on privately owned lands, but again, substrates are moderate in size (cobbles and some small boulders) and not subject to scour. Peak flow effects on channel morphology are generally not found on high-gradient (>10%) streams and are minor in most step-pool systems (Grant et al. 2008).

Stream channels directly downstream of harvest units are Rosgen A and B channels (Rosgen and Silvey 1996). Based on the bank and channel substrate of these streams, they have a low (Rosgen B3) to extreme (Rosgen A4) sensitivity to disturbance rating and a very poor (Rosgen A4) to excellent (Rosgen B3) recovery potential. Field assessments confirmed that streams in the project area are in good conditionChanges in channel conditions are not expected to occur because gradients are mostly >10%, large wood material is present and anchored, steam banks are well armored with vegetation and rock, substrates are primarily cobble size and angular and are unlikely to be displaced by elevated water yield or peak flows.

3.11.6.2.2 Sediment Yield

Ground-disturbing harvest activities can also increase erosion and sediment loads in the intermittent and small perennial channels within and adjacent to treatment units (0–2 years). Topography, retained woody material, and no-cut RHCAs would capture and store most of the erosion material. As ground cover is reestablished, hillslope erosion would diminish (0–3 years). Headwater streams and wetlands typically trap and retain much of the sediment that washes into them. The faster the water travels, the larger the particles it can carry. Natural obstructions in small streams, such as rocks, downed logs, or even just a bumpy stream bottom, slow water and cause sediment to settle out of the water column (Meyer et al. 2003). Also, as gradient flattens and stream energy diminishes fine sediment is deposited. Deposition often occurs at area where higher gradient tributaries or sections of streams meet lower gradient streams. As noted above in the water yield section, lower gradient areas (<2%) occur in short, dispersed segments in most of the of the main channels and are the areas where larger amounts of fine materials are located and stored (see field survey information).

The NEZSED model was used to estimate the predicted percent increase in sediment yield from the proposed activities under Alternatives B, C, and D. **The predicted increases in sediment production by the NEZSED model are for relative comparison to existing conditions and do not reflect actual instream sediment yields expected from the project.** Modeling was done on a peak year basis in order to meet the assumptions under which Appendix A of the Nez Perce Forest Plan was developed. It is highly unlikely, however, that all of the activities proposed would occur in a single year.

The NEZSED model results have their primary utility in comparing differences between each proposed alternative and the existing condition; model results are also useful for comparing the proposed alternative to the guidelines of Appendix A of the Forest Plan. The sediment yield guidelines were established to reflect the sediment-carrying capacity of the stream system. The guidelines for each watershed are shown in Table 3-40. A more detailed discussion of the NEZSED model is in the Forest Plan Appendix A guidance document (Conroy and Thompson 2011).

As shown in Table 3-40, each of the prescription watersheds would remain below the sediment yield guidelines allowable under Forest Plan Appendix A (USDA Forest Service 1987a), under all alternatives. Table 3-40 displays the percent sediment yield over base, the natural (base) erosion rate, and increase in sediment yield. The highest increases were found in Alternative C, followed by Alternative B, then D. Sediment yields would return to current conditions within 10 years as modeled, and would be approximately 1% less than Alternative A due to system road decommissioning activities.

Table 3-40. NEZSED Estimated Sediment Yield

Watershed[a] (Natural Erosion Rate[c] (NER) in T/yr/mi²)	Percent over Base (Natural) Sediment Yield (T/yr/mi²)[d]					
	Alt. A	Alt. B	Alt. C	Alt. D	Forest Plan Appendix A—Sediment Yield Guidelines[b]	Alts. B, C, D
	Year 1					Year 10
Pine Knob Creek NER= 111	1% 113	18% 131	18% 131	18% 131	45%	1% 113
Browns Spring Creek NER = 121	2% 123	29% 156	30% 157	27% 153	45%	2% 123
Clear Creek NER = 383	1% 386	18% 452	18% 451	15% 442	30%	1% 386
Solo Creek NER = 79	2% 81	21% 96	21% 96	19% 94	45%	2% 81
Middle Fork Clear Creek NER = 169	1% 170	11% 188	11% 188	9% 183	30%	1% 170
Kay Creek NER = 121	1% 123	5% 128	5% 128	4% 126	45%	1% 123
South Fork Clear Creek NER = 622	1% 625	9% 677	10% 681	7% 666	45%	1% 625
Hoodoo Creek NER = 247	2% 252	31% 322	32% 326	27% 313	60%	2% 252

[a] Big Cedar Creek and Lower Clear Creek Face watersheds were not assigned fish/water quality objectives or sediment yield guidelines, primarily because most of the area is on private lands.
[b] Forest Plan Appendix A guidelines to meet fish/water quality objectives
[c] Natural Erosion Rate is the base sediment yield (in Tons/year/square mile) a watershed would produce under natural conditions.
[d] Tons per Year per Square Mile

No adjustment was made in the modeled sediment yield for increased traffic associated with project activities. It is acknowledged that some additional sediment yield would occur due to traffic increases from logging operations. This would be mitigated through road maintenance, road improvements, rock surfacing, application of dust abatement material, and timber contract provisions. Foltz (1996) found that rock surfacing with good quality aggregate reduced the sediment produced from unpaved forest roads.

At the levels planned, harvest and burning activities would be considered an entry when compared to the Forest Plan standard. With no activities qualifying as entries in 9 of the prescription watersheds in the last decade, all alternatives are within Forest Plan Appendix A guidelines for sediment yield. For Pine Knob Creek, an entry was made in 2005 for the Middle Fork timber sale. This watershed is allowed 2 entries per decade, so it also meets the Forest Plan guideline.

Implementation of project design measures, adherence to BMPs, and maintenance of no-harvest RCHAs would reduce potential erosion and further limit the risk of sediment reaching streams. Any sediment yield increases would be short-term (0–6 years following project activities), and beneficial uses in Clear Creek and the Middle Fork Clearwater River would be maintained.

3.11.6.2.3 Conclusion for Regeneration, Improvement, and Commercial Thinning Activities:

The combination of water yield and sediment yield effects from harvest activities are not anticipated to result in changes in channel morphology of sufficient magnitude to alter physical parameters such as width/depth ratio or pool volume in 3rd to 5th order streams. Some changes could occur in limited reaches, especially in small headwater streams, where localized bank cutting or scouring could occur.

Forest harvest and fuels treatments should have minimal adverse effects on water quality if they are carefully designed and conducted in accordance with best management practices (MacDonald and Stednick 2003). Proposed harvest activities are currently planned to be separated into seven different timber sales over a 7-year period. This is only an estimate and is subject to change based on the decision made as a result of this EIS. Proposed timber sales are staggered across the Clear Creek watershed to better distribute harvest activities. For example proposed harvest in the Upper Clear Creek subwatershed is scheduled to be separated into four sales. Project specific design measures (see Chapter 2) were created to minimize potential increases in sediment and water yields. Best Management Practices and Soil and Water Conservation Practices (FSH 2509.22) are incorporated into the design criteria.

3.11.6.2.4 Prescribed Burning

Low- and mixed-severity prescribed fire is proposed on 1,370 acres in 15 units (701–715) for all action alternatives. This activity was assessed using ECA and the NEZSED model and resulting increases in ECA and percent sediment yield over base are incorporated in the earlier discussion above. .

Burn severity would be low enough to maintain much of the duff layer to help prevent germination of invasive species. Fire would not be ignited within PACFISH buffers (riparian or landslide prone), although fire would be allowed to back into these areas. This design measure would reduce the potential for erosion on sensitive landscapes and areas close to stream channels.

In addition, 42 acres of restoration is proposed in bunchgrass communities. This area would be treated through prescribed burning and revegetated with native grasses and forbs. Burn severity is expected to be low, with no increase in soil erosion.

3.11.6.2.5 Precommercial Thinning

Although precommercial thinning would cause some opening of the canopy, ECA would not increase; therefore, water yield would not increase either. Ground vegetation would be left undisturbed. Thinning would be completed with chainsaws, so no ground-disturbing activities would take place; therefore, neither soil erosion nor sediment input to streams would increase.

3.11.6.2.6 Temporary Road Construction

Approximately 36 miles of temporary roads would be constructed to access harvest units for Alternatives B and C, 8.7 miles of which occur on existing templates. Alternative D proposes 17.5 miles of temporary roads, including 8.7 miles located on existing templates. Temporary roads generate the most erosion when they are first constructed, and lesser erosion would occur during the 1–2 years the proposed roads would be open. Erosion would stabilize 2 years after decommissioning occurs. Temporary roads were included in the ECA and NEZSED analyses. Increase in ECA from temporary road construction is <1% for all watersheds and increase in water yield from this activity is unlikely. As outlined in the Implementation Guide to Appendix A (Conroy and Thompson 2011), temporary roads interior to harvest units are not modeled separately, but are incorporated into the computation for the harvest unit, and are not considered separately. For instance, where a temporary road is located on an unstable mid-slope or crosses streams, the road is modeled separately. Roads exterior to harvest units are modeled separately. Temporary roads calculated individually are modeled as having an erosion rate increase of 18,000 tons/square mile the year of construction, 5,000 tons/square mile for the years the road is being used and one year after decommissioning, and then goes to zero two years after decommissioning.

The erosion potential from temporary roads for all alternatives would be short-term (4 years), since the roads would be built, used, and decommissioned over a period of 1–2 years and located on low-gradient, dry ridges or upper slopes, away from water, with no stream crossings.

Project design measures for temporary roads would minimize the erosion produced over the short life of these roads. For example, temporary roads would be closed to public motorized use during project activities, reducing the chance of increased erosion from vehicles driving on wet roads and rutted surfaces. Water bars and placement of roads on the landscape help to reduce the likelihood of channelized flow leaving the road surface and entering riparian areas or system road ditches. Temporary roads would be decompacted and fully recontoured following project activities. Large wood material and organic materials would be positioned over exposed soils to reduce erosion potential and better accelerate recovery.

3.11.6.2.7 Road Reconditioning and Reconstruction

Road reconditioning of system roads is proposed on approximately 48.8 miles. Each of the roads proposed for reconditioning are listed in Appendix B. Reconditioning is a combination of road ditch clean-out, blading and shaping the road surface to maintain a proper road template and drainage, or surfacing. This treatment is similar to road maintenance. Road reconditioning was calculated as an increase in sediment yield in the NEZSED model. As outlined in Conroy and Thompson (2011), road reconditioning is modeled as moderate reconstruction with an erosion rate increase of 18,000 tons/square mile the year of work Erosion rates return to the existing 5,000 tons/square mile in year 2. The entire 48.8 miles was modeled in NEZSED, but in actuality only portions of road in need of treatment are actually reconditioned.

Road reconstruction of system roads is proposed on approximately 119.8 miles. Each of the roads proposed for reconstruction are listed in Appendix B. Reconstruction includes replacing and installing new culverts for cross drains and live water crossings, placement of rock surfacing, placement of roadway fill, and installation of new signs or gates. Road reconstruction was calculated as an increase in sediment yield in the NEZSED model. As outlined in Conroy and Thompson (2011), road reconstruction is modeled as major reconstruction with an erosion rate increase of 67,500 tons/square mile the year of work and 18,000 tons/square mile in year 2 (similar to new permanent road construction). Erosion rates return to the existing 5,000 tons/square mile in year 3. The entire 119.8 miles was modeled in NEZSED, but in actuality only portions of road in need of treatment are actually reconstructed.

A recent study using GRAIP monitoring showed that 7% of all drainage points in the study area delivered 90% of the road related sediment, and 2% delivered 50% of sediment (Black et al. 2013). Most of the roads in the Clear Creek Integrated Restoration project area were evaluated in the field and road recondition and reconstruction was prescribed as needed. These road improvement activities should address the key points that are delivering the highest amount of sediment to streams. Adding cross drains to roads in order to drain ditches prior to entering perennial stream channels will reduce sediment delivery dramatically.

Road maintenance and improvements are considered a beneficial effect to water quality (Burroughs 1990; Grace and Clinton 2006; Switalski et al. 2004; Swift and Burns 1999). Surface graveling has been shown to be effective at reducing erosion from road surfaces, especially at road/stream crossings. Studies have found gravel reduces sediment by 70%–79% (Burroughs and King 1989). Increased drainage culverts, especially on either side of stream channels, would further disconnect the road system from the perennial stream network; lessening sediment delivery. Although this activity is designed to reduce sediment input over the long term, a minor increase in sediment is expected to occur at the time of the activity and the year following (2 years).

3.11.6.2.8 Road Decommissioning

Road erosion and sediment yield usually decline over time but continue at a chronic level indefinitely (USDA Forest Service 1981). Approximately 13.2 miles of road are proposed for decommissioning with this project. Road removal would reduce road density (Table 3-41) and provide an improvement in the overall watershed condition. However, even with the proposed road decommissioning, the current (existing) watershed condition ratings would remain the same for each of the watersheds. For Big Cedar Creek, road miles on the Forest Service portion of the watershed were reduced by 20%. Road miles on LSP areas were reduced by 15%.

At the HUC 12 level, road density in Upper Clear Creek went from 3.1 mi/mi^2 (high/poor condition) to 2.8 mi/mi^2 (moderate condition). In Lower Clear Creek, road density went from 3.0 mi/mi^2 to 2.9 mi/mi^2. South Fork Clear Creek road density remained moderate at 1.8 mi/mi^2. Table 3-41 displays the number of road miles proposed for decommissioning within each of the Forest Plan Prescription watersheds and resulting road densities. Table 3-41, Column 2, shows road density prior to the South Fork/West Fork Clear Creek road decommissioning project that was completed under a separate Environmental Assessment (USDA Forest Service 2011b) and was incorporated into the existing condition of this project. Although assessed during the same NFMA as this project, it was determined that decommissioning 10.0 miles of system road prior to the completion of this project would accelerate watershed recovery.

Table 3-41. Estimated Reduction in Road Density from Clear Creek Project Activities

Forest Plan Prescription Watershed	Road Density Before EA[a] (2011)	Existing Road Density[b] (miles/miles^2)	Proposed Road Decommissioning (miles)	Road Density after Clear Creek activities[b]
Pine Knob Creek	4.8	4.8	1.81	4.3
Browns Spring Creek	4.1	4.1	4.52	3.2
Clear Creek	2.3	2.3	0.52	2.3
Solo Creek	3.5	3.5	1.34	3.1
Middle Fork Clear Creek	2.4	2.4	1.29	2.2
Kay Creek	2.6	2.5	0.94	2.4
South Fork Clear Creek	1.6	1.6	0	1.6
Hoodoo Creek	4.6	3.8	0.78	3.8
Big Cedar Creek	4.6	4.6	1.72	4.4
Lower Clear Creek Face	1.8	1.8	0	1.8

[a] South Fork/West Fork Clear Creek Road Decommissioning 2011 decision.

[b] Includes private and Forest Service roads

Road decommissioning activities would benefit water resources by reducing flow energy on roadbeds and within ditches, while reducing road-related sediment. The proposed road decommissioning projects include the removal of culverts, which would improve stream bank stability, width-to-depth ratio, and floodplain connectivity at localized sites.

Road decommissioning activities would produce some short-term sediment, both temporally and spatially (Foltz et al. 2007). Some short-term sediment delivery is expected in the smaller tributaries that bisect the decommissioned roads. Sediment would be delivered during project implementation and during the stream channel stabilization period of 2–3 years. Past monitoring of obliteration showed only minor amounts of sediment delivered to headwater streams, mostly in the form of suspended sediment, as indicated by increases in turbidity.

Design criteria and BMPs would be applied to each of these activities to minimize increases of sediment delivery to stream channels. Road decommissioning may produce short-term (0–3 years) and localized sediment increases, but it would produce both immediate and long-term recovery benefits.

3.11.6.2.9 Water Temperature

The Clear Creek project is not expected to measurably influence stream water temperatures. This would be due primarily to implementation no-harvest RCHAs, and thus would have minimal impact on stream shading in the project area. The aquatics specialist’s report discusses stream temperature in more detail.

3.11.6.2.10 Floodplains and Wetlands

US Fish and Wildlife Service National Wetlands Inventory maps were initially reviewed for inventoried wetlands. Approximately 1525 acres of wetlands were identified in the project area and 103 acres are located within proposed harvest units. Field reviews by hydrologists, fish biologists, botanists, and soil scientists were conducted within all timber harvest and burn units and on all roads where work would be performed under this project. Stream channels, seeps, springs, wet areas, hydrophilic vegetation, hydric soils, and wetlands were identified and were mapped using field GPS techniques and subsequently digitized into GIS to ensure they were tracked.

Within harvest units all wetlands, including seeps, springs, and streams would be protected by no-cut PACFISH buffers. There would be no temporary road construction constructed within floodplains or wetlands.

Direct and indirect effects could occur on wetland areas and within stream floodplains during installation, replacement and/or removal of culverts. However these effects, both undesirable and beneficial, are expected to be insignificant.

Section 404 of the Clean Water Act requires permits to dredge or fill within waters of the United States. The U.S. Army Corps of Engineers administers these provisions. Each year, the Forest consults with appropriate agencies to evaluate permitting needs on all actions that could affect stream channels (including wetlands). Culvert removal and replacement activities proposed under the Clear Creek project would require authorization under section 404, through application of either nationwide or site-specific permits.

No proposed project activities are expected to negatively change the functions or values of wetlands and floodplains as they relate to protection of human health, safety, and welfare; preventing the loss of property values, and; maintaining natural systems. The goals of Executive Orders 11988 and 11990 would be met.

3.11.6.3 Cumulative Effects

Cumulative effects arise when the incremental impact of an action is added to impacts from past, present, and reasonably foreseeable actions. Past harvest activities and associated road construction have had the most impact, with increases in water yield and sediment yield in the Clear Creek drainage and its tributaries.

The cumulative effects area is the Clear Creek watershed (HUC 10), which encompasses the entire Clear Creek project area and state and private lands.

The temporal scope for watershed effects extends from the 1950s to 2037. The beginning date is based on the time frame of the first harvest and road construction activities in the watershed. Evidence from those events is still noticeable on the landscape in the form of old skid trails and landings and the current road system. The scope continues to year 2037, which is approximately 24 years after project implementation, the estimated amount of time required for ECA levels from this project to be no longer perceptible.

3.11.6.3.1 Past, Present, and Reasonably Foreseeable Actions

Several timber sales have occurred in the Clear Creek watershed (see project file and ECA analysis). Timber sales conducted between the early 1950s and late 1990s involved many miles of new road construction, little to no tree retention in regeneration harvest areas, and dozer piling of slash. These activities resulted in widespread and persistent impacts on the subwatersheds and caused increased sedimentation and increased water yields. The Forest Service manages 72% of the Clear Creek watershed, and past harvest activities have occurred on approximately 28% of that Forest Service land.

Forest practices have changed over the last few decades. Project design measures, BMPs, and Forest Plan guidelines have been developed in order to reduce ground-disturbing activities and subsequent sediment delivery. Operating under dry conditions, implementing no-harvest RHCAs, retaining trees in regeneration harvest units, and limiting ground-based yarding to slopes <35% have become common practices.

Over 30 miles of Forest Service system roads have been decommissioned in the Clear Creek watershed since 1996. This activity produced localized short-term sediment during implementation but created long-term sediment reductions and benefits to overall channel conditions.

Present actions include permitted grazing, recreation, fire suppression, road maintenance, and control of noxious weeds using chemical, mechanical, and biological methods. Recreational activities produce little to no impact to water quality or quantity or to floodplain/wetland functions. Most effects from recreation are primarily due to associated road use, especially during wet conditions. Effects from grazing include stream bank instability and reduced water infiltration rates in areas with soil compaction (localized areas). Fire suppression activities are infrequent and limited in size. Road maintenance has minimal short-term effects and long-term benefits (Burroughs and King 1989). Watershed improvement needs were identified during the pre-NEPA stage of this EIS. Some of the concerns were addressed through projects that were completed under separate decision documents and were incorporated into the existing condition of this EIS and were included in the NEZSED analysis. Although assessed during the same pre-NEPA assessment as this EIS, it was determined that implementing these projects through separate NEPA and prior to the completion of this EIS would accelerate watershed recovery. Watershed improvement projects associated with this project and which a majority have been implemented: 10 miles of system road decommissioning, 73 miles non-system road decommissioning, 4 miles road reconstruction, 49 culvert replacements, and 22 culvert removals. (See Appendix J of FEIS for a more detailed outline.)

The following concurrent or foreseeable future actions may occur in the Clear Creek watershed:

- Eastside Allotment project (decision 2014): This project includes an adaptive management plan to improve pasture and water quality conditions while keeping livestock numbers the same.

- Clear Ridge Road Decommissioning (decision 2015): This project proposes 65 miles of nonsystem roads for decommissioning, which will improve water infiltration and reduce soil erosion potential.
- Harvest of state of Idaho lands: The Bruin Storm project harvested approximately 160 acres with a seed tree prescription in the Lower Clear Creek subwatershed in 2013. This activity was included in the ECA analysis.
- Private land harvest: This project includes undetermined amount and prescription of harvest of private lands in the Crane Hill area (Upper Clear Creek subwatershed) in the next 5 years. Harvest is expected to occur on less than 200 acres.

The first two projects are considered watershed improvement projects and will help to improve water quality and quantity. Any increases in erosion and subsequent sediment yield would be short-term and in isolated locations.

The last two projects are harvest activities that could increase ECA and soil erosion. The small amount of acreage involved would increase ECA by <1% in the Clear Creek watershed. These projects would follow water and soil quality protection practices regulated through the Idaho Forest Practices Act.

Alternative A—No Action

Cumulative effects arise when the incremental impact of an action is added to impacts from past, present, and reasonably foreseeable actions. Alternative A would create no direct or indirect effects; therefore, no cumulative effects to water yield or sediment yield would occur under this alternative.

Alternatives B, C, and D

3.11.6.3.2 Water Yield

Even though NFS lands comprise 72% of the Clear Creek watershed, they contribute 84% of the average annual flow of Clear Creek. The estimated existing ECA for the Clear Creek watershed is 4% and includes past activities on Forest Service, state, and private lands. Because harvest and burn history were not available for private or state lands, size and date of forest openings were determined using NAIP imagery in ArcGIS and Google Earth software.

Estimated increases in ECA from the Clear Creek project are 9% for Alternative C, 8% for Alternative B, and 7% for Alternative D. When these increases are added to the existing ECAs, they produce ECA estimates that predict what watershed conditions will be like after the Clear Creek project. Final ECA estimates are 13% for Alternative C, 12% for Alternative B, and 11% for Alternative D. A lower ECA indicates a higher (better) watershed condition. ECAs of <15% at the HUC10 scale indicate high (good) condition (NOAA 1998).

A 6% increase in average annual water yield for Clear Creek was calculated for Alternative C using formulas and graphs from *Forest Hydrology - Hydrologic Effects of Vegetation Manipulation, Part II* (USDA FS 1973). Most 3rd through 5th order drainage channels on the Nez Perce National Forest can sustain a 10% increase in average annual runoff as a result of timber harvest before increases are detectable (USDA Forest Service 1973). Clear Creek is a 5th order stream starting two miles from within the Forest Boundary (confluence with Middle Fork Clear Creek) to the mouth.

ECA estimates predict that watershed conditions would remain high (good) under all three action alternatives and percent increase in annual water yield would be below the 10% detectable level. Therefore, no stream channel alteration from increased water yield is expected from the Clear Creek project in mainstem Clear Creek.

As shown in Figure 3-11, ECA would decrease to its pre-project level (4%) after 12 years for Alternatives B and D and after 14 years for Alternative C. ECA from Clear Creek activities would no longer be discernible after 22 years.

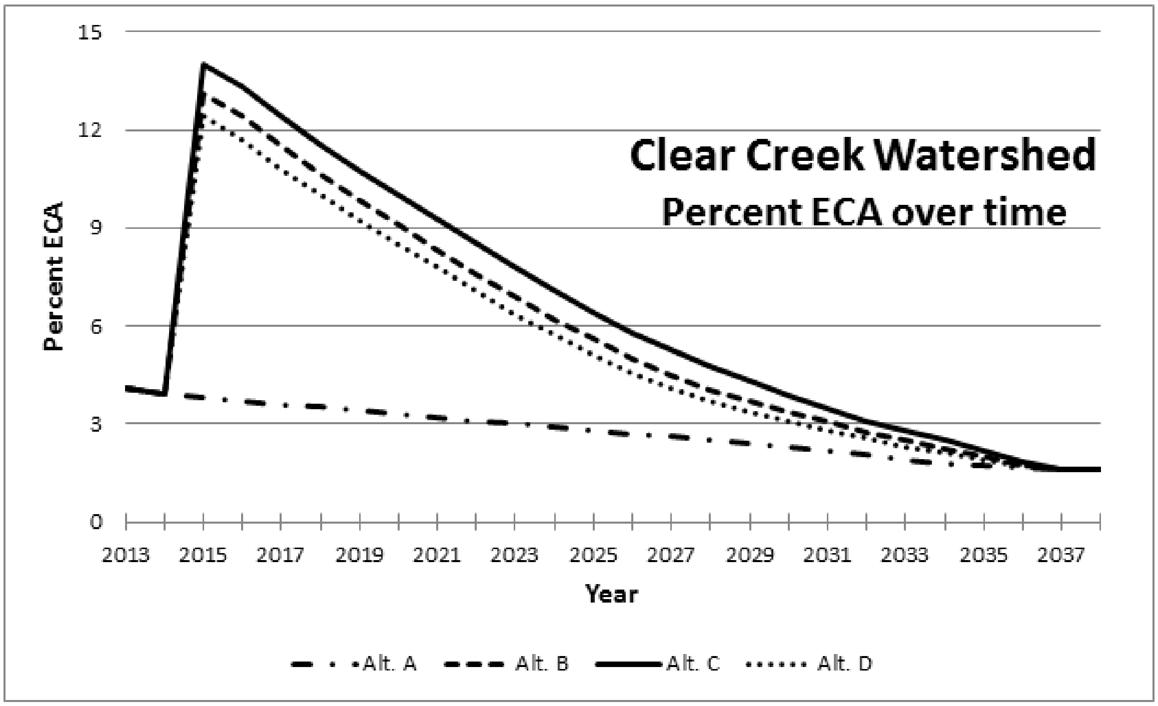


Figure 3-11. Percent Equivalent Clearcut Area (ECA) Over Time for Clear Creek Watershed (5th Field HUC) (Note: Includes Forest Service and private lands)

As shown in the above discussions, a broad review of available literature discussing harvest activities and water yield/peak flows was conducted. Much of the analysis regarding water yield for this project was based on older literature (1970s) that established general thresholds and guidance for determining ECA, ECA recovery, and increases in water yield. They also created the foundation for Nez Perce Forest Plan (1987) direction.

Alternatively, new research indicates that water yield increases (and associated effects on streams) may not be as important as previously thought, especially in the context of contemporary forest management. The primary concern about changes in water yield is how they may directly or indirectly affect stream channels, aquatic habitat, and water quality. Numerous studies have documented the effects of forest canopy removal on water yield, but surprisingly, very few have demonstrated a direct link between water yield changes and channel impacts in a forested environment. For example, Schnakenberg and MacDonald (1998) found no correlation between ECA and stream channel characteristics in forested catchments in Colorado.

MacDonald et al. (1995) studied the relationship between WATSED-predicted water yield increases and channel characteristics on the Kootenai National Forest. None of the channel types (pool riffle or colluvial step-pool) showed any increase in bankfull width or width-to-depth ratio with more intensive management. However, correlations were found between management indices and sediment characteristics; these correlations suggest that sediment delivery is a more important consideration than water yield.

Analysis of reference and managed streams on the Flathead National Forest suggests no relationship between bankfull width and the degree of management (Kendall 2011), a finding that is consistent with the results of MacDonald et al. (1995).

Grant et al. (2008) conducted a comprehensive literature review and determined no field studies have made a direct link between peak flow increases and channel impacts. Grant et al. (2008) concluded that the effects of peak flow increases are relatively minor in comparison to other anthropogenic changes to streams and watersheds. In general, channel impacts associated with peak flow increases alone are likely to be much less significant than other impacts associated with forest management activities. Management-induced increases in peak flow generally diminish with the percentage of watershed impacted and increasing recurrence interval. Management effects on peak flow events over a 6-year recurrence interval are highly speculative (Grant et al. 2008).

Considering the merits of all viewpoints and the above analysis, increases in water yield or peak flows are not anticipated to be detectable at the HCU10 scale (5^{th} order stream) and negligible stream channel alteration form increased flows are expected from the Clear Creek project. Project design measures including no-cut harvest buffers, green tree retention guidelines, low to moderate severity prescribed burning, and implementation of Best Management Practices would reduce likelihood of increased water yields.

3.11.6.3.3 Sediment Yield

Although the NEZSED model did predict an increase in sediment yield, the increase was below that allowable under Forest Plan Appendix A for the associated prescription watersheds.

Figure 3-12 shows the predicted sediment yield percent over base increased at the Forest boundary from Clear Creek project activities for each alternative. Estimated percent increase in sediment yield would be highest in Alternative C at 17%, followed by 16% for Alternative B, and then 14% for Alternative D. Estimates includedthe existing sediment yield over base from past project activities, plus the additional sediment yield generated from the Clear Creek project. As indicated between the years 2013 to 2014 a slight decrease is shown due to the implementation of the SF/WF Road Decommissioning project. Also, sediment yield percent over base declines below the existing amount in 2021 (as modeled) due to the 13 miles of road decommissioning and road improvements proposed in the Clear Creek project. Road density in the Clear Creek watershed was reduced from 2.7 mi/mi^2 to 2.6 mi/mi^2.

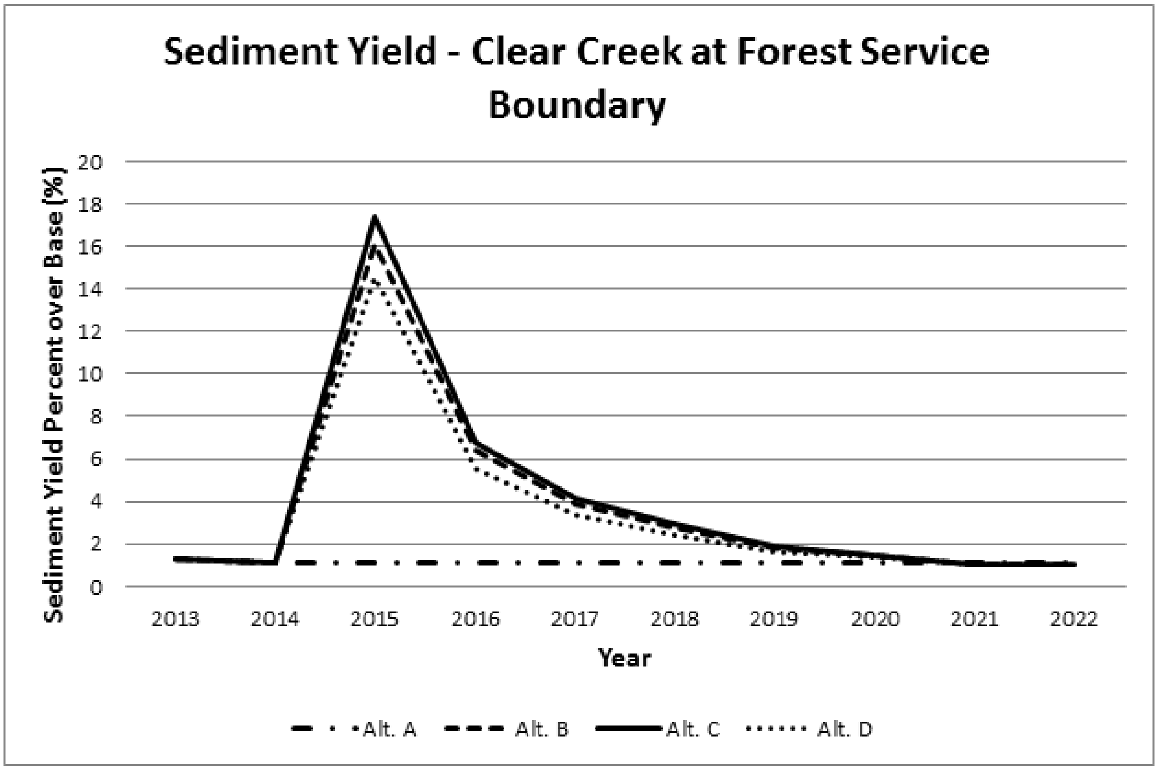


Figure 3-12. Sediment Yield Percent Over Base (Natural) for Clear Creek at Forest Service Boundary (Note: Includes National Forest System lands only)

An upward trend analysis following guidance from Conroy and Thompson (2011) was completed for the project (Appendix J). The analysis showed that although there would be some short term increase in sediment yield, there would be long term improvement over the existing condition (Appendix J).

Implementation of project design measures, adherence to BMPs, and maintenance of no-harvest RHCAs would reduce potential erosion and further limit the risk of sediment reaching streams. Any sediment yield increases would be short-term (0–6 years following project activities), and beneficial uses in Clear Creek and the Middle Fork Clearwater River would be maintained.

3.12 Wildlife

This section summarizes the effects of the alternatives on the management of wildlife resources. This section was modified from the “Clear Creek Restoration Project Wildlife Report,” located in the project file.

3.12.1 Analysis Area

Direct, indirect, and cumulative effects analysis areas considered home range size, mobility, habitat requirements, habitat availability, and habitat quality of the analyzed species. In most cases, the direct, indirect, and cumulative effects analysis area is the 43,700-acre project area which includes all proposed activity areas. It is large enough to assess the effects of proposed activities, but not so large as to make habitat changes undetectable. . Effects were based on the acres of potential habitat treated by proposed activities, or affected by natural events such as fires, insect and disease outbreaks and so on. The timeframe for direct and indirect effects is 5 years (unless otherwise stated), which is the estimated time needed to complete harvest activities. For old-growth, elk, and lynx predetermined analysis units were used as required by Regional or Forest Plan direction. There are 7 old growth analysis areas, 7 elk analysis areas (EAAs), and a small portion (3,300 acres) of one 24,000 acre lynx analysis unit in the analysis area.

The analysis area includes 43,700 acres of National Forest within the upper two-thirds of the Clear Creek drainage which includes the 9200 acres (21%) Clear Creek Roadless Area. The roadless nature of this area provides secure habitat for many species, such as wintering elk herds, which are dependent on more remote, isolated environments with relatively little human disturbance.

Terrestrial environments in the area are diverse and provide habitat for many birds, mammals, reptiles, and amphibians. Wildlife habitat is dominated by grand fir and western red cedar at mid-elevations (91%). Open, dry ponderosa pine/Douglas-fir forest, dry and moderately moist grand fir/Douglas-fir forest, and grasslands comprise 8% of the lower elevation, more westerly portions of the area. Cool subalpine forests in the headwaters make up the remaining 1% of the area.

The primary ecological settings in the area are the Idaho Batholith Breaklands, Idaho Batholith Uplands, and Idaho Batholith Subalpine. The Subalpine setting is found on only 160 acres, has no treatments proposed in it, and will therefore not be addressed in this assessment.

The Breaklands provide a variety of forest conditions that offer a mix of forage and cover for wintering big game and many forest raptors. Large trees, especially western larch, Douglas-fir, western red cedar, grand fir and some ponderosa pine, provide habitat for a variety of cavity-using species. Fires and endemic insect infestations also provide a continuous supply of standing snags for wildlife nesting and feeding.

Young forests are essential for providing quality elk and white-tailed deer winter browse. Preferred browse species include redstem ceanothus, mountain maple, scouler willow, and service berry. These are associated with mixed-coniferous forests and are adapted to, and thrive following, dry-season (summer/fall) fire. North-slope habitats provide mid-seral and mature forest habitats for northern goshawk. Southerly exposed habitats provide mature, open-forest conditions for flammulated owls. Large patches of mature and old-forest habitats throughout provide nesting and foraging habitats for pileated woodpecker. Large standing/down dead wood levels typically range from 7 to 13 tons/acre.

Sensitive and Management Indicator Species that would benefit the most from achieving the desired vegetation conditions on the breaklands include the flammulated owl, pygmy nuthatch, goshawk, pileated woodpecker, and elk summer and winter range.

The Uplands provide young-forest habitats that offer quality elk and deer spring, summer, and fall forage. Plant communities with Pacific yew are a key moose winter browse. Moose favor mature grand fir forest habitats with a closed tree canopy and moderate snow depths. Moose also successfully forage in shrub habitats commonly following stand-initiation disturbances.

Large patches of mature- and old-forest provide nesting and foraging habitats for pileated woodpecker and denning and prey habitats for fisher and American marten. Mid-seral and mature-forests provide habitat for northern goshawk. Infrequent wildfires favor the accumulation of large standing/down dead wood, which typically range from 20 to 40 tons/acre.

Standing snags provide roosting habitats for several Sensitive bat species (fringed, long-legged, and long-eared myotis) as well as foraging and nesting habitat for a variety of birds. Large downed wood provides cover, foraging, and denning habitats for Sensitive western toads and ringneck snakes. Sensitive and Management Indicator Species that would benefit from achieving the desired vegetation conditions in the Uplands include the American marten, fisher, moose, elk winter range, pileated woodpecker and goshawk.

3.12.2 Regulatory Framework

3.12.2.1 Nez Perce Forest Plan

The 1987 Forest Plan documents goals, standards, objectives, and guidelines for managing Forest wildlife species and habitats. Project related Forest Plan wildlife standards and objectives are displayed in Table 3-42. The Proposed Action complies with the Nez Perce National Forest Land and Resource Management Plan requirements relevant to wildlife species and their habitats.

3.12.2.1.1 *Proposed Forest Plan Amendments and Impacts to the Wildlife Resource*

Appendix C contains the proposed site-specific Forest Plan Amendment for soils. The proposed activities would create some disturbance to wildlife from noise and activity by human and machines. The duration would be two or three days in each affected unit, during daylight hours. The long-term benefit for wildlife from the soil amendment would be repairing scarred areas to the level of producing vegetation that would function as forage or habitat for terrestrial species.

Appendix D is a Forest Plan Amendment to Appendix N: to adopt best available science for classifying old growth and snag management at the Project specific level. This allows a better interpretation of different habitats, age, number of trees, basal area and other characteristics that assist the biologist with which wildlife species would use different types of old growth. The Forest Plan is less detailed, but does encourage field verification. The amendment table shows the number of samples: which are the number of plots from the plot data base that met the screening criteria and are used in the old growth type descriptions. The amendment does not affect Forest Plan requirements for the amount and distribution, or identification and designation of old growth. The amendment would not affect the Forest plan for MA 20.

The snag amendment provides the best available science for determining snag potential and recommendations for snag retention according to the habitat type affected by the prescribed harvest treatment. The amendment would provide more snags for wildlife than the Forest Plan standards.

Table 3-42. Forest Plan Compliance, Wildlife Resources

Standard Number	Forest Plan Standards Subject Summary	Compliance Achieved By
1	Maintain viable populations of existing native and desirable non-native vertebrate wildlife species	Viable populations would continue to be maintained in the project area and on the Forest.
5	Coordinate with the Idaho Department of Fish and Game to achieve mutual goals for fish and wildlife.	The Forest continues to work with the IDFG in managing wildlife species and their habitat. IDFG has a representative on the project ID Team.
6	Use "Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho" to manage for and to assess the attainment of summer elk habitat objectives in Project evaluations (Appendix B).	The Forest uses these guidelines to assess existing condition and effects of Project alternatives. This Project was analyzed using the Guidelines (see Elk section).
7	Provide management for minimum viable populations of old-growth and snag dependent species by adhering to the standards stated in Appendix N.	Old-growth standards would be met or exceeded with this Project. Snag standards would be met or exceeded. See Chapter 2 Design Measures.
10	Maintain or improve elk habitat at, or near, optimum levels by applying elk guidelines in key wolf areas outside wilderness.	Elk forage production would increase by implementing this Project. Elk guidelines were applied to wolf habitat in the Project area.
13	Consult with IDFG and USFWS to determine management of known or suspected initial wolf home sites.	Correspondence with IDFG and USFWS occurred with this Project. No known or suspected wolf home sites occur in the Analysis Area.
Page II-6	Habitat will be maintained to provide for population viability of all sensitive species…Important habitat components include riparian zones, caves, mine shafts, snags, and large open waters. Management actions will acknowledge and protect other key habitat components important to these species as they are discovered and accepted.	Riparian habitat conservation areas are protected by implementing PACFISH/land management plans, there are no caves, mine shafts or open water bodies in the Project area. Snag and large down wood retention would meet minimum Region 1 guidelines. No old-growth habitat would be regeneration harvested. See Chapter 2, Design Measures.

Standard Number	Forest Plan Amendment 20 Subject Summary	Compliance Achieved By
FW 1	Design and implement fish and wildlife habitat restoration and enhancement that contributes to Riparian Management Objectives	This Project implements Forest Plan Amendment 20 (PACFISH).
Objective	**Forest Plan Objective Subject Summary (FP page II-5 & II-6)**	**Compliance Achieved By**
Page II-5	Road access and timber sale scheduling will be coordinated to achieve the elk summer habitat objectives. The Forest-wide goal is to manage for at least 75, 50, and 25% habitat effectiveness in the high, moderate, and low areas, respectively.	The "Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho" (Leege 1984) was used to determine objectives have been achieved in the affected elk analysis unit.
Page II-6	[Pacific yew] communities will be managed under appropriate silvicultural prescriptions to maintain habitat for existing and slightly increased moose populations. Road access will be controlled during fall and winter to reduce harassment and poaching.	The Project has been designed to comply with this objective in MA 21 (Chapter 2, Design Measures). There would be no permanent road construction. There are no access management changes proposed.
Page II-6	Viable populations of old-growth-dependent species will be maintained.	No MA 20 old-growth habitat would be harvested. Riparian habitat conservation areas would be protected. Snag and large down wood retention would meet minimum Region 1 guidelines.
Page II-6	Habitat will be maintained to provide for population viability of all sensitive species…Important habitat components include riparian zones, caves, mine shafts, snags, and large open waters. Management actions will acknowledge and protect other key habitat components important to these species as they are discovered and accepted.	Riparian habitat conservation areas are protected by implementing PACFISH/land management plans, there are no caves, mine shafts or open water bodies in the Project area. Snag and large down wood retention would meet minimum Region 1 guidelines. No old-growth habitat would be regeneration harvested. See Chapter 2, Design Measures.

3.12.2.2 Endangered Species Act of 1973

This act directs that actions authorized, funded, or carried out by federal agencies do not jeopardize the continued existence of any threatened or endangered species, or result in the adverse modification of habitat critical to these species. It is also the responsibility of the Forest Service to design activities that contribute to the recovery of listed species in accordance with recovery plans developed as directed by the ESA (50 CFR part 402). Section 9 of the ESA of 1973, as amended, requires threatened and endangered species be protected from "harm" and "harassment" wherever they occur, regardless of recovery boundaries. This Project analyzed effects to Canada lynx, the only listed wildlife species in the Project area. All Action Alternatives are consistent with the Northern Rockies Lynx Management Direction (NRLMD) and are in compliance with the ESA and FSM 2670. Informal coordination with the USFWS on this Project was initiated on September 28, 2012.

3.12.2.3 National Forest Management Act

This act requires the Forest Service to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives (16 USC 1604(g)(3)(B)). The Forest Service's focus for meeting the requirement of NFMA and implementing its regulations is on assessing habitat to provide for diversity of species. All alternatives would be consistent with NFMA direction for diversity of animal communities. Although the Action Alternatives analyzed in the Project may impact individual animals, the Project would not affect the viability of any species across its range. The Vegetation Section discusses the distribution of age classes (successional stages) and shows the Project area is trending toward historic distributions of each successional stage. Design measures (Chapter 2) were developed to retain elements of diversity (green trees, snags, and large down wood) in harvested areas. Additionally, there would be no timber harvest in RHCAs or verified old growth.

Sensitive Species: Sensitive wildlife species are those that show evidence of a current or predicted downward trend in population numbers or habitat suitability that would substantially reduce species distribution. Federal laws and direction applicable to sensitive species include the NFMA and FSM 2670. The Forest is required to determine the potential effect of proposed activities on SS and to prepare biological evaluations. The Forest Service is bound by federal statutes (ESA, NFMA), regulations, and agency policy (FSM 2670) to conserve biological diversity on NFS lands and assure sensitive species populations do not decline or trend toward listing under the ESA. This document fulfills the requirements of the biological evaluation for sensitive species. The Proposed Actions would not affect sensitive species viability on federal lands, nor would it cause sensitive species to become federally listed as threatened or endangered.

Species Viability: The Proposed Action, in combination with and within the context of past, present, and reasonably foreseeable future management actions in the Analysis Area, would not affect population viability or distribution of native and desired nonnative vertebrate species on the Forest. The Draft Idaho Comprehensive Wildlife Conservation Strategy (IDFG 2005) contains information on species of concern or interest including range-wide and state-wide status and known population information. At the Forest-wide scale, this Project would not disturb, agitate, or bother populations to a degree that causes, or is likely to cause, a measurable decrease in productivity by substantially interfering with normal breeding, feeding, or sheltering behavior.

3.12.3 Resource Indicators

The primary indicator for direct, indirect, and cumulative effects to wildlife species is the effect to their habitat, or disturbance associated with proposed activities. Existing habitat conditions were determined by field observations, vegetation data, habitat modeling, disturbance/management history, and sighting records. Analysis indicators for species analyzed in detail are displayed in Table 3-43.

Table 3-43. Wildlife Analysis Indicators Used to Compare Alternatives in the Clear Creek Integrative Restoration Project Area

Species	Analysis Indicator
American, marten, Black-backed Woodpecker, Fisher, Flammulated Owl, Fringed Myotis, Long-eared Myotis, Long-legged Myotis, Mountain Quail, Pygmy Nuthatch, Northern Goshawk (nesting habitat), Pileated Woodpecker (nesting habitat), Ringneck Snake, Western Toad	Acres treated in modeled suitable habitat
Elk Winter Range (MA 16)	Acres treated in Forest Plan MA 16
Elk Summer Range	Elk Habitat Effectiveness Areas meeting Forest Plan Standards using Leege (1984)
Elk/Wildlife Security	Number of Elk Analysis Areas meeting recommendations for elk security
Gray Wolf	Elk Habitat Effectiveness Areas meeting Forest Plan Standards Number of Elk Analysis Areas meeting recommendations for elk security
Canada Lynx	Acres of denning habitat treated Acres of foraging habitat treated Consistency with Northern Rockies Lynx Management Decision
Moose Winter Range	Acres treated in Forest Plan MA 21

3.12.3.1 Special Features for Wildlife

Some features in the forest provide unique habitats for some of the Sensitive or management indicator species. These features are snags, old growth and riparian areas.

3.12.3.1.1 Snags

Snags have been recognized by the scientific community as critical habitat for numerous vertebrate wildlife species (McClelland 1977; Thomas et al.1979). Standing dead trees provide some of the most suitable nest and roost sites, owing to characteristics of wood and its decay patterns (Bull et al.,1986). Snags provide forage opportunities for woodpeckers and other cavity nesters to feed on insects and other invertebrates that are boring holes in the trees or digesting tree cambium.

Species that depend on snags and analyzed in this section include bats, black-backed woodpecker, fisher, pygmy nuthatch, American marten and pileated woodpecker. These species use snags for nesting, perching or foraging, and/or a combination of uses.

Natural effects to recruitment of snags include fire events, insect and disease outbreaks.

Natural factors affecting the loss of snags include fire, wind or snow events, soil slumps or landslide events and decay. Human effects that increase snags are from man-made fire. Likewise, snags are lost from timber harvest operations, prescribed burns and firewood cutting.

The management for snags is found in Appendix N-3 of the Forest Plan. The Nez Perce Snag standards include:

Riparian areas- manage to support 80% of maximum populations of snag-dependent species by maintaining a minimum of 1.8 snags/acre; with 1 snag per 10 acres ≥ 20”dbh & rest ≥ 12”dbh. Due to windthrow or other causes, in riparian areas, 5 green trees/acre must be retained: 1≥ 20”dbh, the others≥ 12” dbh.

All other areas outside of riparian areas are to support 60% of maximum populations of snag-dependent species by maintaining a minimum of 1.4 snags/acre; with 1 snag per 10 acres ≥ 20”dbh & rest ≥ 12”dbh. Due to windthrow or other causes, in riparian areas, 4 green trees/acre must be retained: 1≥ 20”dbh, the others≥ 12” dbh.

Clumps and individual trees should consider safety, resistance to windfall, efficient logging operation, ease of slash treatment and protection from firewood cutters.

The Clear Creek Project would use Forest Plan Amendment #42 to retain or recruit more snags per acre than the Forest Plan Standards. Using the best available science, Bollenbacher et al. (2009) recommend 9-14 snags per acre, depending on the habitat types. For all proposed units, and average of 14-28 live and/or dead trees per acre would be maintained. The numbers and dbh for snags would vary according to the habitat type of the unit (see snag portion of Amendment 42).

3.12.3.1.2 Old Growth

The same forest plan Amendment #42 would replace the Forest Plan standards for old growth with best available science from Green et al. 1992, errata corrected 2/05, 12/07, 10/08, 12/11. Table 1 in the document shows the description, minimum criteria and associated characteristics of old growth by habitat type. The amendment adopts definitions for old growth based on successional stages, habitat types and other site conditions by Green et al. 1992.

Old growth indicator species are wildlife dependent on or find optimum habitat in old growth stands for at least part of their life cycle. Primary indicator species are the pileated woodpecker, northern goshawk, and fisher; while the American marten is considered a secondary indicator species as it inhabits both mature and old growth stands.

The Amendment would not change the Forest Plan objective for MA 20, which is to maintain viable populations of old-growth dependent wildlife species. To maintain the latter, a minimum of 10% of total forested acres should be managed as old growth, with ≥ 5% of the forested acres managed as old growth within each prescription watershed or combination of watersheds (5,000 to 10,000 acres). If less than 5% of old growth is in a drainage, additional required acres will be assigned to adjacent drainages from available excess old growth. An additional 5% of forested acres in each prescription watershed shall be designed as replacement old growth.

Stands will be identified through the use of stand exam information, aerial photos, and field reconnaissance. Stands should be ≥ 300 acres; however, the next best would be a core block of 150 acres with blocks ≥ 50 acres less than ½ mile away. If existing blocks of old growth are less than 100 acres, stands between the old growth blocks will be designated as replacement old growth and managed as an old growth complex. If the complex contains less than 50% of the old growth component, then the entire complex should be considered as replacement old growth.

Linear strips ≥ 300' wide along streams are acceptable if more suitable sites are not available. Where possible, roads should not be located through or adjacent to old growth stands to reduce human disturbance, snag loss to firewood cutters, windthrow and micro-climate changes.

To increase the probability of species immigration and colonization of old growth islands and to facilitate genetic exchange between isolated population demes, a system of interconnected corridors of old growth islands is required. Riparian zones will serve as the principal means to provide these interconnecting corridors.

Finally, verify the quality, amount and distribution of existing and replacement old growth habitat as part of project planning (Forest Plan, Appendix N-1,2).

The Clear Creek Integrated Restoration (CCIR) Project would meet the 10% old growth Forest Plan standards in all alternatives.

3.12.3.1.3 Riparian Areas

Riparian areas are important to many wildlife species for forage, water, cover, nesting, in some cases denning, movement corridors, and vegetation diversity or structure. Kauffman and Krueger (1984) present a rich list of referenced authors that discuss the value of riparian ecosystems to wildlife. Olsen et al. (2007) discuss the the importance of stream-riparian areas for amphibians. Knopf et al. (1988) explain that less than 1% of the western landscapes in the US are covered by riparian vegetation, yet this habitat provides for more species of breeding birds than surrounding uplands.

All wildlife species analyzed by the forest are known to use riparian areas sometime in their life cycle. Forest Plan goals mention maintaining a diversity and quality of habitat to support viable wildlife populations (Goal 3), provide habitat and contribute to recovery of T&E species (Goal 4), stream channel stability and water flow (Goal 20), water quality (Goal 21) and protect or enhance riparian-dependent sources (Goal 22). Forest Objectives address managing riparian areas for the betterment of wildlife and other values Page II-5, FP. Standard 1 for the Wildlife and Fish resources is to maintain viable populations of existing native and desirable vertebrate wildlife species; which would include the habitats of such.

3.12.3.1.4 Forest Plan Standards for Riparian Areas (Page II-22): abbreviated interpretations

1. No management in riparian areas that causes detrimental changes/conditions in water quality or fish habitat.
2. Preferential consideration to riparian-area dependent resources (wildlife, fish, plant). Protect and if applicable, improvement of such resources.

3. All effects on wetlands or floodplains must be considered in all alternatives during the environmental analysis process.
4. Delineate and evaluate riparian areas in project areas prior to activities.
5. Manage riparian areas for cover and security for riparian-dependent species with emphasis on T & E species.Analysis

3.12.4 Methodology

The Nez Perce Forest Plan designated 11 management indicator species (MIS). The Forest Service Northern Region (R1) has identified 21 sensitive species (SS) that are suspected or known to be present on the Forest. The USFWS recognizes the Forest as secondary area, unoccupied habitat for threatened Canada lynx. Additional information for these species can be found in the Project file.

The wildlife analysis identifies wildlife species and/or their habitat potentially present in the Analysis Area. Species include ESA listed, sensitive and MIS. The analysis presents the distribution, population status, and habitat ecology of each species and their existing habitat conditions. Modeling of potential habitat in the Analysis Area was conducted using GIS and was based on vegetative characteristics preferred by each species.

Table 3-44 displays the habitat criteria used to identify suitable habitat for each species. Suitable habitat considered includes that necessary for breeding, nesting, rearing, and foraging activities. Suitability is based on stand characteristics such as tree species, tree size, and tree canopy cover. Other habitat quality considerations include patch size, snag numbers and size, downed wood, riparian habitat, and security areas. Stand criteria used to assess species' habitat suitability were obtained from peer-reviewed technical literature on species specific research.

Table 3-44. Habitat Criteria Used to Identify Suitable Wildlife Habitat in the Analysis Area

Wildlife Species	Primary Tree Species[a]	Tree Diameter (inches dbh)	Tree Canopy Cover (%)	Age Class (years)	Suitable Habitat (Acres)
Canada Lynx (Threatened)	Denning Foraging	–	–	–	1,221 1,428
North American Wolverine	Modelled areas of persistent snow period	-	-	-	6,257
American Marten	SAF, S, LLP, GF, WRC	-	>30	>100	20,305
Black-backed Woodpecker	All Species; burnt, diseased or insect infested	>10	>40	>40	2,357
Fringed Myotis	PP, DF	>12	<30	>100	277
Long-legged Myotis Long-eared Myotis	All Species	>15	All	>100	16,844
Fisher – Summer – Winter	WRC, GF, DF, LPP, SAF, S	>13 Sapling/Young	>40 >40	>100 -	10,037 13,570
Flammulated Owl	PP, DF	>15	40-60	100+	236
Mountain Quail	All Habitats in VRU 3	-	-	-	187
Northern Goshawk Nesting	PP, DF, WL, LPP, GF, WWP	>13	>35-70	>50	2,066
Pileated Woodpecker Nesting	Dead or dying PP, WL, DF, WWP, GF, WRC	>20	25-60%	-	3,142
Pygmy Nuthatch	PP, DF	>10	<60	>80	581
Ringneck Snake	VRU 3	–	–	–	3,030
Western Toad Uplands	All species on southerly aspects	All	<30	–	510
Moose Winter (MA 21)	Mapped MA 21 Outside MA 21	–	–	–	2,700 8,156

[a] PP- ponderosa pine; DF- Douglas-fir; WL-Western larch; WWP-Western white pine; LPP- Lodgepole pine; GF- grand fir; WRC- Western redcedar; S- Englemann spruce; SAF- Subalpine fir

Habitat status and population viability at the Forest level is presented for some species based on Forest Service Northern Region analyses (Samson 2006a, 2006b; Bush and Lundberg 2008). This provides a broader scale context relative to the Analysis Area. Samson's Conservation Assessment (2006a) work was based on literature reviews, habitat use in the Northern Region, estimates of habitat per national forest, short and long term viability evaluations for 4 species (northern goshawk, black-backed woodpecker, flammulated owl and pileated woodpecker). The conservation assessment is based on a principle-based approach to population viability analysis (PVA). The methods and background for this approach uses point observation data and vegetation inventory information based on Forest Inventory and Analysis (FIA) data to build wildlife habitat relationship models and analyze short-term viability. FIA produces statistical reports and analytical information on status and trends in forest area and location; species, size, and health of trees; total tree growth, mortality, and removals by harvest; wood production and utilization rates for various products; and forest land ownership during the period 1975 though July 2001. The Samson (2006b) habitat estimates added analyses on the fisher and American marten with the four previously mentioned species, and uses data through 2005. Estimates of forested habitat for each national forest in the USDA Northern Region were developed by remote sensing to provide estimates of forest versus non-forest habitats. He discusses threshold habitat amounts, home ranges of species and minimum viable population for six species. Bush and Lundberg (2008) review Samson's work and document updates to his habitat models (metric units, habitat types, formatting errors and so on) used in Region 1 and provide estimates of habitat amounts. All three of these documents and their authors are referred to in the wildlife sections for the concerned species. Their work is referred to as the potential amount of forest scale habitats for these species.

The analysis for species in this project is based on vegetation models and information collected in the field. The effects of the project are described and provide the potential acres of habitat the project would affect for each analyzed species.

Discussion of the regional analyses is to compare project effects to the calculated amount of forest available habitat produced by the region.Viability of the concerned species is at a much larger scale than the project level.

This analysis uses the best available science to assess effects. Data related to vegetative features model potential habitat, including species, age, size, density, canopy cover, and harvest history were taken from the TSMRS, FSVEG, FACTS, 2011 VMap, and LIDAR databases. <u>Disturbance events were analyzed from fire history, insect and disease updates and harvest history. Other forest layers used for potential habitat or impacts to species include roads, streams, land ownership and so on.</u> The database was recently updated with stand exams that were conducted in 2011 and 2012. ArcMap GIS was used for modeling, mapping, and quantifying habitats and Project impacts. Considerable information on wildlife habitat conditions was obtained from the following four supporting documents: *Clear Creek NFMA Assessment* (USDA Forest Service 2011a); *Selway and Middle Fork Clearwater Rivers Subbasin Assessment* (USDA Forest Service 2001); *Proposed Land Management Plan Nez Perce National Forest* (USDA Forest Service 2007a), and; the *Nez Perce National Forest Plan* (USDA Forest Service 1987a). Field review of treatment areas was conducted in 2011 and 2012. Field visits combined with National Agricultural Imagery Program (NAIP) images were used to validate information gathered from other sources.

The Idaho State Conservation Data Center (CDC) is the primary storehouse of sensitive or rare wildlife species survey and observation data. CDC data was mapped within a 5-mile radius of the Project area boundary to identify sensitive species potentially using the Project area. Additional wildlife sighting from district historical records may be used in this section. Old-growth habitat was identified using NRIS R1 Old-Growth Report Query based on 2011 and 2012 stand exams and field review during the same time period. The Idaho State Wildlife Comprehensive Wildlife Conservation Strategy provides background habitat and population information and is incorporated by reference (IDFG 2005).

Information for bird species has been synthesized from the Northern Region Land Bird Monitoring Program with data available from the North American Breeding Bird Survey (Sauer et al. 2011).

Population trend information for elk and moose was synthesized from data available from the Idaho Department of Fish and Game research reports.

This analysis incorporates the effects on terrestrial sensitive species and fulfills the requirements of the required Biological Evaluation, per direction pertaining to the FSM and streamlining process (USDA Forest Service 1995). The streamlined process for doing biological evaluations for sensitive species focuses on the following two areas:

- Incorporating the Effects on Sensitive Species into the NEPA Document
- Summarizing the Conclusions of Effects of the Biological Evaluations for Sensitive Species

The following Regional Forester sensitive species may occur in the Project area: black-backed woodpecker, fisher, flammulated owl, fringed myotis (bat), gray wolf, long eared myotis, long-legged myotis, mountain quail, pygmy nuthatch, ringneck snake, and western toad.

3.12.4.1 Species Dropped from Detailed Analysis

The following Sensitive species or MIS species were dropped from detailed analysis as suitable habitat is not present, or the project would not affect individuals or their habitats: American peregrine falcon, bald eagle, bighorn sheep, black swift, Coeur d' Alene salamander, common loon, harlequin duck, long-billed curlew, Townsend's big-eared bat, white-headed woodpecker, yellow-billed cuckoo, and grizzly bear. Appendix F includes a table displaying these animals and the reasons why they were not further analyzed.

3.12.4.2 Species Analyzed in Detail

The area used for species analysis is primarily the 43,700 acres Project area scale. This scale is small enough to detect potential changes in habitat but not too large for them to be diluted beyond measure. There are several species where specifically identified analysis units are required to be used for the analysis. They include: Old Growth Analysis Areas (OGAAs), Lynx Analysis Units (LAUs), and EAAs.

The common direct affects from the action alternatives to the following analyzed species would be potential disturbance from project activities. This would include noise from machinery and other human activities. Those species dependent on current habitat may be displaced from the proposed activities. Other species may move to unharvested areas during daylight hours and return during hours of darkness. The latter species may continue to visit units between the time periods of different activities. Upon completion of the activities (roadwork, timber harvest, prescribed burning, tree planting) in the units some species would return. The time frame of return depends on the species and its preference for the various stages of revegetation that would occur over time.

Fire suppression is the foreseeable management action that would occur in the project area that could affect species habitats. It is the only foreseeable action considered in the cumulative effects analysis for all species. All past activities are considered as part of the existing condition and there are no present activities that would affect the analyzed species. Private and state lands comprise a very minor presence in this project area (less than 1,000 acres among 3 sections in the northwest corner. Due to the small size and lack of information on present or foreseeable activities, the cumulative effects of fire suppression to the analyzed animals in this report would be immeasurable.

3.12.5 Environmental Consequences

3.12.5.1 General Effects of Proposed Action Alternatives for Wildlife

The existing condition of the project area was created by natural events (wildfire, insect and disease outbreaks, weather events (drought, climate change, and so on)). Human-caused events are considered as well: harvest history, roads. These events are explained in other sections of this chapter (vegetation, fuels, aquatics, noxious weeds, rare plants, soils and watershed.)

The general indirect effects of the action alternatives would be disturbance noise from machinery, human activities and presence (project activities, woodcutting, recreational activities, and so on) and smoke from prescribed burns. Some losses of potential habitat would occur to the analyzed species. Indirect effects would be an animal's avoidance of the area until activities are finished. Some individuals of various wildlife species would be potentially displaced, until forest vegetation reaches the structure (age, density, cover, availability of food, security) that would encourage individuals to return.

Cumulative effects vary dependent on the species preference for certain types of forest structure. Past actions leading to the present condition are explained in other sections of the chapter as mentioned in the first paragraph of this short segment.

3.12.5.2 Threatened, Endangered, Candidate or Proposed Species (TES)

3.12.5.2.1 *Canada Lynx*

The Canada lynx was listed as a threatened species under the Endangered Species Act (ESA) in March 2000. A Lynx Conservation Assessment and Strategy (Ruediger et al. 2000) or LCAS document was developed to attempt a consistent and effective approach to conserve Canada lynx and to assist with Section 7 consultation under the Endangered Species Act. The Forest Service (FS) signed the LCAS with the USFWS in 2001, and agreed to halt projects that were "likely to adversely affect" lynx until the plans were amended. The renewed 2005 LCAS added the concept of occupied mapped lynx habitat. The USFWS issued a Recovery Outline for Canada lynx to serve as an interim strategy to guide and encourage recovery efforts until a recovery plan was completed. In 2006, the LCAS was amended to define occupied habitat and to list those National Forests that were occupied; the goal was to provide guidance necessary to conserve lynx (USDA Forest Service and USDI Fish and Wildlife Service 2006). In March 2007, 18 Forest Plans were amended with the Northern Rockies Lynx Management Direction (NRLMD) Record of Decision (ROD) (USDA Forest Service 2007c NRLMD ROD, Attachment 1, p. 1). The LCAS was revised in August 2013 by the Interagency Lynx Biology Team, incorporating the best available science that had been published since previous editions.

Based on examination of historical and recent evidence, the 2005 Canada lynx recovery outline categorized lynx habitat and occurrence within the contiguous United States as either core areas, secondary areas, or peripheral areas (USDI Fish and Wildlife Service 2005). “Core areas” show long-term persistence of lynx populations within the contiguous United States. These areas have verified records of lynx occurrence over time and recent evidence of reproduction. The fluctuating nature of lynx population dynamics and the ability of lynx to disperse long distances have resulted in many individual occurrence records outside of core areas, without accompanying evidence of historic or current presence of lynx populations. Areas classified as “secondary areas” are those with historical records of lynx presence with no record of reproduction; or they are areas with historical records and no recent surveys to document the presence of lynx and/or reproduction. If future surveys document presence and reproduction in a secondary area, the area may be considered for elevation as a core area. Secondary areas may contribute to lynx persistence by providing habitat to support lynx during dispersal movements or other periods, allowing animals to then return to core areas. In “peripheral areas” the majority of historical lynx records is sporadic and generally corresponds to periods following cyclic lynx population highs in Canada. There is no evidence of long-term presence or reproduction that might indicate colonization or sustained use of these areas by lynx. However, some of these peripheral areas may provide habitat enabling the successful dispersal of lynx between populations or subpopulations.

Besides the recovery outline categories, the Forest Service’s NRMLD document addresses occupied and unoccupied forests. All lynx habitat on a forest is considered occupied if 1) there are at least two verified lynx observations or records since 1999, and 2) there is evidence of lynx reproduction on the national forest (NRMLD 2007b). Unoccupied lynx habitat would be the absence of the factors that are considered for occupied habitat. Core habitat is always considered occupied, while secondary and peripheral areas could be occupied or not by lynx.

In the NRLMD, the Nez Perce National Forest was considered as unoccupied habitat based on the best scientific information available at the time of the NRLMD Forest Plan Amendment. Further information from past and present literature led the USFWS to modify their interpretation of lynx presence. In 2012, the USFWS sent a letter addressed to then Forest Supervisor, Rick Brazell on December 10, 2012 stating that “there is consensus that transient lynx may be present on the Nez Perce National Forest, at least occasionally”. The letter also stated that, “the issue of lynx occupancy on the NPNF is a separate but related matter that is not the focus of this letter, and did not change the NPNF status as ‘unoccupied’. Therefore, under the NRMLD, the Nez Perce National Forest is considered unoccupied, the USFWS has determined that lynx “may be present”, and the Forest is considered to be a secondary area.

Lynx typically live in mesic coniferous forests that have cold, snowy winters and provide a prey base of snowshoe hare and other animals. Historical and current lynx records in the Northern Rocky Mountains occur primarily in the Douglas-fir forest, spruce-fir forest, and fir-hemlock forest. A gradient in the elevation distribution of lynx habitat is apparent across the area. In the higher latitudes of northern Idaho and northwestern Montana, lynx habitat generally occurs above 4,000 feet (Ruediger et al. (LCAS) 2000). Based on these habitat attributes, the Nez Perce National Forest mapped lynx habitats and established Lynx Analysis Units (LAUs) for the entire forest.

An LAU is an area of at least the size used by an individual lynx, from about 25–50 square miles (Ruediger et al. 2000, Interagency Lynx Biology Team 2013).

Historical (prior to 1999) and recent anecdotal observations of lynx across the forest have occurred. However, these observations are not “verified” as defined by the NRLMD (USDA Forest Service 2007b, pp. 99–100, 142–143; USDI Fish and Wildlife Service 2006, p. 4), and anecdotal sightings do not determine a resident population. Reputable sightings include lynx caught in traps and then verified by the Idaho Department of Fish and Game.

The Rocky Mountain Research Stations conducted surveys for lynx in 2007 for the Nez Perce National Forest. The surveys were conducted according to established protocols outlined in the NRLMD (Ulizio et al. 2007). The surveys conducted in 2008 (hair snare) and 2009 (winter track surveys) were reduced in size and scope due to snow conditions, limited personnel and limited funding. No lynx were detected during any of these survey efforts (2007, 2008, or 2009). During the winter of 2013 snow track surveys were conducted for lynx, with no evidence of the animal detected.

In this project, the modeled lynx habitat will be analyzed as secondary areas that may provide habitat for dispersing lynx to travel between core areas. The USFWS concluded that Forest vegetation management in secondary areas would provide adequate connectivity and forage habitat for dispersing lynx in the absence of specific habitat management direction (USDI Fish and Wildlife Service 2007).

The analysis for direct, indirect, and cumulative effects on Canada lynx is the action area encompassing the project area (43,731 acres) and LAU 30 (24,057 acres). Modeled lynx habitat in this LAU contains the following habitats: foraging (34%), denning (33%), unsuitable (2%), and non-lynx habitat (31%).

Disturbance in the past 30 years has been from wildfire (1,817 acres) and timber harvest (1,012 acres). The total disturbance in LAU 30 is 2,829 acres or 11.7%. This conforms to the Standard Veg S1 of no more than 30% of the lynx habitat in an LAU is currently in a stand initiation structural stage (see Appendix F). Standard for Veg S2 is met as only 61 acres (less than 1%) have been regenerated in the past 10-year period. The threshold for this standard was no more than 15% (see Appendix F).

LAU 30 is an isolated unit. No LAUs are adjacent to it, and the closest neighbor is about 1.8 miles to the south. The next nearest LAU is 5.7 miles east of LAU 30. Some habitat above 4,000 feet is located outside of LAU 30 and within the project boundary. Habitat modelling shows the area is lacking optimal conditions for boreal forest conditions. Grand fir, western cedar and Douglas fir are the dominant overstory within the project area. The same habitat is found in the portion of the LAU that is located within the project boundary. About 12% of the analysis area has some Engelmann spruce and subalpine fir (USDA Forest Service 2013). This is scattered throughout the area and does not possess the integrity of a connective corridor to lynx as discussed by authors (Squires et al. 2013).

LAU 30 intersects two different WUIs: one lies on the east side of the LAU, while the other is on the north portion. Activities in the action area are located in the northern WUI.

Of the approximate 3,300 acres that lie in both the LAU and the project area, 1,220 acres is foraging habitat, 1,420 acres is denning habitat, 112 acres unsuitable, and 545 acres is non-lynx habitat. Both den and forage habitats are dominated by grand fir with some subalpine fir and a small component (10%) of lodgepole pine. Non-lynx habitat may consist of lakes, meadows, tundra, rock outcroppings, talus fields, and stands not capable of providing lynx habitat. The effects analysis extends 25 years into the future, allowing for new understory feeding habitat and downed woody accumulation to develop in many areas.

Population Trends: Lynx populations occur at naturally low densities and very few museum or trapping records exist for Idaho County (McKelvey et al. 2000). No Canada lynx sighting records have been reported in the Project area (IDFG 2010), and the results of previous surveys have been mentioned. The Nez Perce National Forest considers lynx may be present. This does not suggest that lynx are breeding, denning, or rearing young on the Nez Perce National Forest, but that lynx may move through the Nez Perce National Forest during dispersal events.

Direct and Indirect Effects

Alternative A—No Action

This alternative would have no direct or short-term indirect effects to Canada lynx as no treatments would be conducted. Red squirrel (an alternate forage species to snowshoe hare) habitat would remain available on nearly 50% of mature and old forest in the Analysis Area and about 46% of the LAU. Over the long term (50–100 years), forest succession would continue in the analysis area, as modified by natural processes. Existing younger patches would continue to grow and mature. This succession would tend to reduce lynx foraging habitat, but would increase lynx denning habitat. If wildfires or extensive windstorms occur in the area, foraging habitat could be replenished, but these events may decrease denning habitat. Insect infestations and root disease would continue causing numerous dead trees to fall to the ground, which may provide high quality denning habitat if downed logs are densely layered. Because the events and processes that might affect forest succession (and therefore lynx habitat) in the analysis area are either unknown or highly variable in frequency and size, the long term indirect effect on lynx of Alternative 1 is not predictable.

Alternatives B, C, and D

Activities proposed for the portion of LAU 30 are timber harvest, temporary road construction and decommissioning, prescribed burning and tree planting. Initially, over 200 acres of pre-commercial thinning were proposed. Some studies have found that this thinning of the understory reduces forage and cover for snowshoe hares (Bull et al. 2005, Griffin and Mills 2007). Therefore, all precommercial thinning has been dropped in the LAU.

All harvest units are under 40 acres, with vegetative buffers in between. Connectivity would remain available for lynx by such buffers, as well as riparian and mature stands. Regeneration and/or commercial thinning treatments would revert areas to the stand initiation stage, and over time create snowshoe hare habitat within proximity to denning habitat. Desired stand conditions (see target stands in vegetation section) may offer denning opportunities with prescriptions for snag, green tree, and coarse woody debris retention.

Initially, some units occurred in modeled lynx habitat. Field surveys by the silviculturist found the "denning" habitat did not have the composition of desirable tree species (LPP, SAF, ES), nor the structure (root wads, woody debris, blowdown) to meet the definition of denning habitat in the NRMLD ROD, 2007. Therefore, no denning habitat in this LAU would be affected by the project. The result of regeneration harvest would create a transition of the affected units to a stand initiation stage by removing the dense grand fir overstory and diseased Douglas-fir.

For Alternative B, proposed commercial thinning would occur in 66 acres of foraging habitat, and regeneration in 7 acres of foraging habitat. Combined harvest treatments in Alternative B would treat about 1% of forage habitat in the LAU. Under Alternative C, foraging habitat would be modified by about 0.7% from proposed regeneration harvest (6 acres) and commercial thin of 55 acres. Finally, Alternative D would modify forage habitat by less than 0.7%: 55 acres from commercial thinning and 2 acres from regeneration. The commercial thinning treatments would remove trees but would retain some overstory cover. The regeneration harvest treatments would remove most trees and convert the stands over to a stand initiation structural stage.

Direct effects to an individual lynx would be noise and logging activities that may disturb lynx and cause the animal to avoid the affected areas. These disturbances would occur during daylight hours, including traffic in all timber harvest units and vehicles traveling to our away from these locations. During hours of darkness, lynx may visit these areas for hunting or to travel through to other locations. The prey base (e.g., snowshoe hares, squirrels,grouse) for lynx would also be affected by the above disturbances and would move into adjacent areas. During hours of darkness some of these animals may move back into harvest units to forage. Indirect affects to the lynx would be its prey base may concentrate along the edges or boundaries of harvested units during nighttime hours. This may offer a more clustered prey base for the lynx to hunt.

The timing of the harvest activities would occur during the normal operating season- late June or early July to October. However, these activities may continue during the winter months, if soil standards are met. During wet seasons (late fall or spring) activities are usually suspended due to soil concerns. The proposed units in LAU 30 are in the southern portion of the Project area. Once logging equipment is moved to that area, it is highly likely that the contractor will focus his resources on completing each block of units before moving on to the next. The regeneration harvest units and one commercial thin unit are clustered in two blocks. A 60-acre commercial thin unit is west of these blocks. It is feasible that all of these units could be harvested in one season. However, it is possible that the duration of these activities may take up to two seasons, about 18 months.

Approximately 36 miles of temporary road building and decommissioning would occur in the Action area. Within LAU 30, about 1.68 miles of temporary roads would be constructed to access timber units (see Appendix F). The largest section would be less than 0.5 miles. All temporary roads would be closed to the public and re-contoured after the project is finished. These activities would create effects of noise and human activities. Again, the disturbances would occur during daylight hours.

The roadwork and construction of about 2 miles of temporary roads would begin in July and be completed no later than August. The construction occurs about a year prior to harvest operations, in order to let the road prism settle and harden before vehicles travel over the track. All activities would occur in daylight hours, and be restricted to a small area of disturbance (the width of the road, plus any cuts and fills). Decommissioning would happen at a later season, after harvest and log hauling is finished. The estimated time span of this work would be from 2 weeks to a month.

Prescribed burning is planned for the regeneration units to clean up slash and to prepare the units for tree planting. Burning activities would generate noise from mechanical (vehicles, pumps) and human activities. Prescribed burning would occur during daylight hours, however, some personnel may stay on site during hours of darkness to monitor the fire. Lynx and other animals would avoid the area due to fire, smoke, noise, and human activity. Recently burned areas usually would not provide forage for the snowshoe hare until the next plant growing season. However, lynx may hunt or move along the edges of these units.

The timing of prescribed burning in the harvest units would generally occur in the autumn, though compatible weather conditions may offer opportunities in the spring. Burning would occur about 3 years after the harvest: allows tree needles to drop from slashed limbs, the weight of the snows to break limbs and compress the slash, and let the woody debris dry out or cure. Once prescribed burning begins, monitoring of fire activities in each unit may warrant up to a week of spot checks after the prescribed burn was initiated.

Tree planting usually occurs during the spring season after the prescribed burn. Disturbances to lynx and its potential prey would be from vehicles and the tree crews moving through units. This activity occurs during daylight and is of very short duration, usually a day or less per unit. The planting crew would require no more than a 15 day period during May and/or June to accomplish all planting of units in the LAU.

In the short-term (0 to 20 years), these acres converted by timber harvest or prescribed fire would be unsuitable habitat until forage becomes available for the snowshoe hare. As the affected areas become older than roughly 20 years of age, the trees become dense and tall enough to provide cover above the snow line and winter forage habitat for the hare.

The combined activities fall within compliance of the standards, guidelines and objectives of the 2007c NRLMD (see Appendix F) and the intent of the LCAS (2013).

Cumulative Effects

Alternative A—No Action

Timber harvest in the Clear Creek Project area has occurred between 1931 and 2009. Timber sales conducted between the early 1950s and late 1990s involved many miles of new road construction, little to no tree retention in regeneration harvest areas, and dozer piling of slash. Since then, forest practices have been modified through project design measures, BMPs and Forest Plan guidelines to reduce ground-disturbing activities.

A total of 2,829 acres (11.7%) of lynx habitat in the LAU has been harvested or burned within the last 30 years. These areas are in the stand initiation or earlier structural stage, potentially providing summer forage habitat for snowshoe hares. A small amount (2%) of this habitat would become potential winter snowshoe hare habitat in 10 years. The rest of the disturbed areas would reach that stage in about 25 years. There would be no cumulative effects to hare or lynx habitat since there are no future foreseeable activities that would affect it.

Alternatives B, C, and D

Past and proposed actions are accounted for and discussed under the direct and indirect effects sections above.

Of the action area considered (64,492 acres), 11,912 acres (18.5%) would be affected by some type of vegetation treatment. In the 24,057 acre LAU 30, the action alternatives would affect approximately 1.2%–1.7% of lands by timber harvest. Of this, 1% or less would be in foraging habitat for lynx. No areas to be treated are considered multi-story forest. All prescribed burns would be within the unit boundaries.

Disturbances generated by the above activities would be short-term, pulse-like occurrences in each individual timber unit. Five of seven units would have temporary roads built. About 1 year later, each unit would be harvested. Temporary roads would be re-contoured. Three to five years later, prescribed burning would be mostly completed. Roughly, 1–2 years after units have been burned, tree planting would occur.

All affected regeneration units would be in the stand initiation phase upon the completion of the above activities: producing understory plants, shrubs and seedlings for snowshoe hare summer forage. Commercially thinned units would be further along in the stand initiation phase, with residual trees and shrubs offering cover and forage for snow shoe hares. In some cases, these stands may provide winter forage for snow-shoe hares. Precommercial thinning units would not provide the latter. However, the latter type of treatment would not occur in LAU 30.

Besides continued fire suppression in the area, the other foreseeable actions in the project area include:

- Browns Spring culvert replacements (decision 2012): This activity involves the replacement and upsizing of 2 culverts in the Upper Clear Creek subwatershed.
- Eastside Allotment project (decision 2013): This project will improve pasture and water quality conditions.
- Clear Ridge Road Decommissioning (decision 2012): This project proposes 65 miles of nonsystem roads for decommissioning, which will improve water infiltration and reduce soil erosion potential.
- Harvest of State lands: The Bruin Storm Project would seedtree harvest approximately 160 acres in the Lower Clear Creek subwatershed in the next 5 years.

- Private land harvest: project includes undetermined amount and prescription of harvest on private lands in the Crane Hill area (Upper Clear Creek subwatershed) in the next 5 years.

Currently, the combination of the Nez Perce and Clearwater Forests has occurred at the administrative level. The newly unified forest is in the planning stages for a new Forest Plan. This will affect all resources (e.g., wildlife, fisheries, soils) by the methods and approaches they conduct for future analyses in their area of concern.

New science literature has been affecting analysis and types of activities in lynx habitats. Projects in unoccupied lynx habitat must consider that lynx may be present, and analysis should use an evaluation table (Appendix F) for NRMLD consistency (Region 1 letter, dated 2009). Some research in Montana suggests that lynx select homogenous spruce–fir patches, and avoided recent clear-cuts or other open patches (Squires et al. 2010). Further discussion in the research article shows that the latter avoidance was apparent during winter, but not so during summer months. Squires et al. (2013) investigated lynx movements in Montana to predict travel corridors based on the animals' resource selection and movement behavior. This study would be of value as the combined Nez Perce–Clearwater National Forests wildlife program analyzes the re-mapping of LAU boundaries and considers travel or linkage corridors in the new forest plan.

The effects of future fire suppression in the project area and the LAU cannot be determined since the amount of potential suppression is not known. None of the listed foreseeable actions would occur in LAU 30. Cumulative effects from the project activities would affect less than 2% of the LAU. Existing potential for Canada lynx habitat and snowshoe hare winter habitats are expected to remain available, well distributed and connected (Squires et al. 2013), within the LAU due to minimal proposed management. Under all action alternatives, the NRLMD standards and guidelines would be met in the LAU.

The biological determination for all action alternatives is a *May Affect, but is Not Likely to Adversely Affect the Canada lynx or its habitat.* This determination is based on the following:

- All objectives, standards and guidelines in the 2007 NRLMD would be met.
- Short-term direct effects to transient lynx may occur related to disturbance (noise and mechanized equipment) during implementation of vegetation treatment. However, any short-term impacts would be offset by the positive benefits of regenerating snowshoe hare habitat for lynx foraging as described as a Guideline in VEG G1(see Appendix F).
- Travel habitat would be maintained across the LAU. Lynx may be present, and are potentially transient animals traversing across the forest. Thus no long-term impacts to individual lynx and their habitat are anticipated.
- Forest roads generally have low speeds and are gravel, and do not pose a threat to lynx. No permanent road construction is proposed. Any new temporary roads constructed will be recontoured after use.
- Lastly, the proposed Federal actions described under Alternative B, C, and D are not occurring within designated critical habitat.

3.12.5.3 Region 1 Sensitive Species

3.12.5.3.1 Fringed, Long-eared, and Long-legged Myotis

The fringed, long-eared, and long-legged myotis are Region 1 Sensitive species. Habitat for the fringed, long-eared, and long-legged myotis occurs in the project area. The fringed myotis is also considered a species of greatest conservation need in Idaho (IDFG 2005).

All three species are known to be multiple habitat bats in regard to roosts, hibernacula, and foraging habitats. They utilize caves, mines, buildings, cliff faces, bridges, exfoliating tree bark, snags, and crevices in rocks as roost and hibernacula sites. Large trees with protective bark and large snags provide the primary roosting habitat in the Analysis Area.

No hibernacula sites are known in the project area. All three species forage where winged invertebrates are available: riparian areas, tree canopies and clearings. All of these areas would encompass the majority, if not all of the project area. Therefore, the estimates for bat species potential occurrence are based on habitat elements each species prefers for roosting. Bat presence on the forest has been detected during the late spring and summer seasons. When bats forage for periods longer than a couple of days, they would require a place to roost. Therefore, the computer analysis for potential bat habitat is based on literature pertinent to roosting habitat needs of each species.

The long-legged myotis occurs in sagebrush steppe, grasslands, and forested montane regions (Romin and Bosworth 2010). Habitat is often relatively continuous tracts of late-successional forest. They forage throughout most of the night (Keinath 2004) in and above the forest canopy (Warner and Czaplewski 1984). In managed forests, the long-legged myotis avoided harvest units unless large snags and old trees were left in relatively high densities, such as in shelter woods and aggregate retention patches (Taylor 1999). These bats have been found in north central Idaho foraging in managed forests with trees that range from 5 to 15 inches in diameter (Johnson et al. 2007). The long-eared myotis often occurs in rocky areas in an extensive variety of habitats (Adams 2003). Individuals typically roost under bark, in tree cavities, in crevices in cliffs, or in abandoned buildings (Romin and Bosworth 2010, Harvey et al. 1999, Nagorsen and Brigham 1993). The species has been found roosting in the snags and stumps of Douglas-fir, western hemlock (Barclay and Kurta 2007), western red cedar (Arnett and Hayes 2009), and pine (Vonhof and Barclay 1997).

Arnett and Hayes (2009) found in their study and others (Crampton and Barclay 1998, Cryan et al. 2000) that the long-eared and long-legged bats typically roost in older forest stands. There are 16,844 acres of suitable roosting habitat for long-legged and long-eared bats in the Project Area.

The fringed myotis inhabits a variety of habitats, including sagebrush steppe, grassland, and montane forests (Adams 2003, O'Farrell and Studier 1980), primarily at middle elevations of 3,900 to 7,050 feet. It is often found in dry habitats where open areas are interspersed with mature forests, creating complex mosaics with ample edges and abundant snags (Keinath 2004). There are 277 acres (see criteria in Table 3-45) of potential roosting habitat in the project area for fringed myotis. The reduction of large diameter trees and snags from previous harvests and the transition of older forests dominated by large shade-intolerant tree species toward a dense structure of smaller diameter, shade-tolerant tree species, primarily due to fire exclusion (Wisdom et al. 2000) have reduced bat roosting habitats. Fire exclusion has changed species composition: gradually replacing ponderosa pine, white pine and western larch, with species less fire tolerant, smaller size, and younger age classes that are more susceptible to insects and disease before reaching maturity. These conditions have limited suitable habitat for fringed myotis in the project area.

Two long-legged and 2 long-eared myotis were captured in the Analysis Area in 2006. Both locations occurred in grand fir forest older than 130 years. The fringed myotis has not been observed in the Project area but they were netted during a bat survey at Moose Creek Ranger Station in 1998. The Station is within 15 miles of the project area and it is assumed that this species could occur in the project area.

Population Trends: Long-legged and long-eared myotis have a global rank of G5 (secure) and an Idaho State rank of S3 (vulnerable). The long-eared myotis is a bat of western North America and one of the most widely reported bats in northern Idaho (Romin and Bosworth 2010).

The fringed myotis has a global rank of G4/G5 (apparently secure/widespread, abundant, and secure) and an Idaho State rank of S2 (imperiled). The Western Bat Working Group (1998) ranked long-eared myotis and long-legged myotis as moderate conservation concern. The present population status of fringed myotis is unknown. The Western Bat Working Group concluded that it may be uncommon or rare through most of its western range. It was one of the least common detected species during surveys in northern Idaho (Romin and Bosworth 2010).

Direct and Indirect Effects

Alternative A—No Action

No timber harvest, roadwork or prescribed burning would occur under Alternative A. Fire exclusion allows forest canopies to become more dense; inhibiting sunlight to potential roost sites. This alters the microclimate of roosts and limits easy access to the sites (Vonhof and Barclay 1997). Fire suppression would continue under this alternative and habitats would become denser, creating conditions that would promote stand-replacing fire. Wildfires can change vegetative structure and composition, altering roost habitat by removing loose, exfoliating bark and opening tree canopy. However, fires assist in snag recruitment, thus potentially providing more roost sites. This alternative could have both positive and negative impacts on long-legged, long-eared, and fringed myotis.

Alternatives B, C, and D

Alternative B would treat 1,278 acres (7.6%), C would treat 1,283 acres (7.6%), and Alternative D would treat 877 acres (5%), of long-eared and long-legged myotis habitat through regeneration and improvement harvest. Thirty to thirty-five acres would be commercially thinned under all alternatives. Under all Action Alternatives, landscape burning would occur on 7 acres (less than 1%) and no PCT would occur in roosting habitat of long-eared and long-legged myotis habitat..Temporary roads would affect 3 acres of less in all action alternatives.

Alternatives B and C would treat 47 acres (17%), and Alternative D would treat 39 acres (14%) of suitable fringed myotis roosting habitat using regeneration harvest. Under all Action Alternatives, no prescribed or landscape burning would occur in fringed myotis roosting habitat. Temporary roads would affect less than one acre of habitat. All proposed activities would occur during daylight hours when bats are usually roosting. Prescribed fire would be initiated during daylight hours, however, it would continue to burn or smolder into hours of darkness. Fatality or displacement may occur to some individuals located in units during harvest, temporary road construction or burning operations. Other general effects of activities are mentioned in the Environmental Consequences.

Large tree and snag, old-growth, and riparian habitat retention, would provide adequate snag habitat for the bat over time. Timber harvest would remove some roosting habitat. However, retained live trees, snags, and legacy trees within treatment units would provide for some roosting and foraging opportunities. Regeneration harvest would also enhance herbaceous growth important for insect production and bat foraging. Long-legged myotis would likely use treated areas due to tree retention within the units. Treatments in fringed myotis habitat would create open areas adjacent to mature stands that contain snags preferred for roosting. Design features include the retention of an average of 14–28 tpa in regeneration and improvement units, of which 9 to 14 snags or recruitment snags of various sizes would be retained. Prescribed burning would be both positive and negative. It would create new snags but may reduce habitat availability by removing bark on trees or causing snags to fall. Burning would create more open areas preferred by fringed myotis resulting in slightly increased suitable habitat.

Cumulative Effects

Alternative A—No Action

There would be no cumulative effects to myotis species since cumulative effects can only arise from proposed actions when combined with past, present, and future foreseeable actions. There are no proposed actions associated with this alternative. However, large snags near roads open to public motorized access may be lost to firewood cutters.

Alternatives B, C, and D

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 100 years because it would take this long to develop large snags in regeneration harvest and burning areas. Past actions have been accounted for in the Environmental Consequences that contribute to the existing condition. Potential roosting habitat for the fringed myotis would be removed or modified by 17% from Alternatives B and C, while Alternative D would impact about 14%. For the long eared/legged bats, Alternatives B and C would remove or modify about 8% of their roosting habitat while Alternative D would impact about 5%.

Foreseeable actions from the Brown Spring culvert replacement would have no impact on the bats. Same for the Eastside Allotment project, as the selected alternative would not change from the present allotment plan. The Clear Ridge Road decommissioning project would reduce some potential foraging habitat, but that would recover in about five years from the end of the project. Any trees affected by the re-contouring of roads would not be of the age preferred for roosting habitats. The Crane Hill private land harvest may affect bat habitat, as acres affected and prescription harvest is unknown. Fire suppression is a future foreseeable management action that could affect snag and old growth habitats. This management tool may reduce snags for safety standards, yet maintain more old trees and snags by suppression efforts that save them from wildfire. Again, snags near roads open to public motorized access are susceptible to loss for firewood cutting.

Wildfires may be allowed to burn in the Clear Creek Roadless Area; however there is no way to determine the extent of fires that may occur. Fire suppression would continue outside the Roadless Area where snags would be created primarily through insect and disease outbreaks. These would be available for use by bats. The direct and indirect effects of the action alternatives are expected to maintain suitable bat habitat both within and outside of treatment areas. Old growth and PACFISH buffers would provide habitat during the cumulative effects time frame. Fire suppression and allowing fire to burn in the Roadless Area would also provide habitat for bats. Forest Plan standards for 1.4 snags/acre of appropriate dbhs would be modified by Forest Plan Amendment 42, leaving 9-14 snags on average per acre, an increase of ten-fold compared to current Forest Plan standards. .

Alternative A would create *No Impact* on the bats or their habitats. Alternatives B and C would affect about 14% of potential fringed myotis habitat. For Alternatives B, C, and D, the determination for fringed, long-eared, and long-legged myotis is *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or reduced viability for the population or species.* Forest management activities can have direct (e.g., fatality) and indirect (e.g., loss of habitat and/or changes in prey availability) impacts on bats. Roost abandonment or death can occur in the winter if bats are disturbed (Adam 2003). Forest Plan Amendment 42 would retain about 10 times the snags or snag recruits compared to current Forest Plan standards. More snags would be available for bat species during the spring and summer period when they are in the project area. Forest Plan standards being met by the project for bats include Standards 1, 7, and Page II-6 from Table 3-43.

3.12.5.3.2 Black-backed Woodpecker

The black-backed woodpecker is a Region 1 sensitive species found in post-fire areas and in areas of insect outbreaks. They occur at highest densities in 1–6 year-old burns where there are abundant snags for nesting and beetles and wood-boring insects for feeding (Hutto 1995a, 1995b; Saab et al. 2004). The woodpecker's presence is primarily influenced by the occurrence of high severity burn patches (Hutto 1995a,b).

Hoyt and Hannon (2002) detected black-backs in a burned area, but not in old growth or mature stands within 30 miles of the 2-year-old burn. However, the woodpeckers did occupy old coniferous stands located 45 to 90 miles from the recent burn. Old forests offer habitat for black-backed populations to persist between fires in regions with long fire intervals (Bonnot et al. 2008).

Bull et al. 1986 found the majority of black-backed nests in dead trees of Ponderosa Pine, lodgepole pine and western larch in their northeastern Oregon study. Nielsen-Pincus (2005) found a preference for Ponderosa pine in her study. Bull et al. (1986) suggest the black-backed woodpecker prefers dead Ponderosa pines because the trees have a thicker layer of sapwood than do other tree species of the same size.

Nearly 180,000 acres burned on the Nez Perce National Forest between 2006 and 2011. Over 155,000 acres burned in 2012. On average 20,000 acres burned per year for the last 20 years. Insect and disease activity has also been occurring since the 1980s. All of these areas that were disturbed in the past 8 years provide potential habitat for black-backed woodpeckers.

Population Trends: Idaho ranks this species as S3 (vulnerable). Breeding bird survey (BBS) data show a long-term upward trend of >0.25% per year since 1966 in northcentral Idaho (Sauer et al. 2011). Idaho Partners in Flight estimates a population of 4000 birds in Idaho. The state-wide population objective is to increase bird numbers to 4400 (Rosenberg 2004).

Samson 2006b indicates 29,406 acres of suitable habitat are required to maintain a viable black-backed woodpecker population in Forest Service Region One. Bush and Lundberg (2008) show over 700,000 suitable acres on the Nez Perce Forest alone. As of September 22, 2012, the very active and prolonged fire season on the Nez Perce and Clearwater National Forests has created over 200,000 acres of burned habitat. From the amount of disturbance and thresholds for viability, there appears to be adequate black- backed woodpecker habitat across the Forest.

A discussion of Samson's work and Bush and Lundberg's (2008) modelling is located after Table 3-45. Bush and Lundberg (2008) used their criteria for black-backed potential habitat: if the plot≥ 8 recently dead trees/acre between 8"-16" dbh. However, not all of these snag areas would have suitable habitat for the woodpecker if the trees have been dead 8 years or longer.

As opposed to forest and region-wide analyses for the black-backed woodpecker, the district biologist compared recent (past 8 years) fire history and insect or disease outbreaks. This information is updated in GIS layers in annual or biennial periods.

One fire burned 36 acres within the Project area in 2008. No other fires have occurred that would provide highly suitable habitat. Endemic populations of black-backed woodpeckers are likely sustained by dying and recently dead standing trees from localized insect and pathogen activity (USDA Forest Service 2007d), such as the tussock moth outbreak that occurred in 2011 in the upper South Fork of Clear Creek. The combined fire and insect affected acres provides an estimated 2,357 acres of suitable habitat for the woodpecker in the Analysis Area.

Field surveys targeting pileated and American three-toed woodpeckers were conducted in 2012 in the Analysis Area. One of 12 sample units detected black-backed woodpeckers. These surveys did not target black-backed woodpeckers, so this is an underestimate of black-backed woodpecker presence in the Analysis Area.

Direct and Indirect Effects

Alternative A—No Action

None of the proposed activities would be implemented. Tree mortality is expected to continue in the upper South Fork tussock moth outbreak area. Root disease is also prevalent in the Analysis Area and would provide a continuous supply of snags. Fire suppression would continue allowing for an increase in fuel loading. This would make the area susceptible to a stand replacing fire event which would create highly suitable black-backed woodpecker habitat.

Alternatives B, C, and D

Alternative B would treat 276 acres, Alternative C would treat 287 acres, and Alternative D would treat 248 acres of potential black-backed habitat through regeneration and improvement harvest. Regeneration harvest would remove snags where necessary for logging safety but would retain them where possible. The snag amendment to this project would retain an average of 9-14 snags/acre, which is 10 times the 1.4 snags/acre in the Forest Plan standards. Regeneration harvest would reduce canopy coverage and foraging opportunities for black backed woodpeckers in affected units. Improvement harvest would reduce canopy cover to 30%–40% which is at or just below preferred levels but would retain large trees and snags. Commercial thinning would retain more trees per acre than the regeneration or improvement cuts. However, not all snags would be retained; only 9-14 snags per acre are required for the snag amendment. In units to be commercial thinned, the desired condition is retention of trees that will benefit from reduced competition. Commercial thinning would treat 233 acres in Alternative B, 223 acres in C, and 215 acres in D.

In summary, potential black-backed woodpecker habitat that would be affected regeneration harvest, improvement harvest, and commercial thinning would be 509 acres (22%) in Alternative B, 510 acres (22%) in Alternative C, and 463 acres (20%) in Alternative D. An example of treatments in or around woodpecker habitat for Alternative C can be found as a map in Appendix F.

Pre-commercial thinning (66 acres in all alternatives) would not impact woodpecker habitat since only small trees are being removed. Landscape burning would occur on 7 acres within all alternatives, which would have insignificant effects on habitat. However, approximately 2,000 acres of prescribed burns outside of current owl habitat would create potential habitat for the woodpecker. Any fire-killed snags would provide potential nesting and/or foraging opportunities for up to 8 years.

In general, project activities would reduce insect and disease mortality and reduce the risk of future stand-replacing forest fires on 20% to 22% of suitable habitat. Commercial and precommercial thinning would indirectly promote large tree growth for future roosting sites but would remove little habitat.

Effects to the woodpecker would be disturbance as mentioned in the Environmental Consequences and removal of habitat by harvest or prescribed fire. The latter may also cause a recruitment of snags.

Use of the Project area by black-backed woodpeckers would continue because untreated areas would continue to provide feeding and nesting habitat. All verified old growth and riparian areas would also be available to the woodpeckers. Outside of fire or insect outbreaks, these latter habitats would most likely provide the most snags and decay present in the forest. The proposed alternatives would meet Forest Plan standards for retaining10% old growth and would meet the Forest Plan amendment for snags.

Cumulative Effects

Alternative A—No Action

There would be no cumulative effects to black-backed woodpeckers since cumulative effects can only arise from proposed actions when combined with past, present, and future foreseeable actions. There are no proposed actions associated with this alternative. However, woodcutting along roads open to public motorized access would remove snags near such roads, which may reduce woodpecker habitat.

Alternatives B, C, and D

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 100-150 years because it would take this long to develop habitats with high levels of snag habitat. Past actions have been accounted for in the existing condition (see the Environmental Consequences for wildlife).

As mentioned, disturbance would be likely to individual black-backs that are foraging or nesting in proposed unit boundaries. Landscape and prescribed burns would create snags that may provide woodpecker habitat. There will be no treatment in verified old growth or riparian areas, which may become susceptible to future fire or insect and disease outbreaks.

The landscape burns of nearly 2,000 acres would provide some foraging and/or nesting habitat to woodpeckers. Snags or recruited snags would also be available in riparian and old growth stands.

Foreseeable projects of the Eastside Allotment and Clear Ridge Road decommissioning would not affect black-backed habitat. The Brown Springs culvert replacement project would not affect the woodpecker or its habitat. The private land harvest may impact insect or diseased trees, but the proposed acreage and treatement is unknown. Fire suppression is a future foreseeable management action that could affect snag and old growth habitats. In the absence of fire suppression, wildfires would likely burn more acres, creating more snags, but potentially burning up old growth areas that may take up to 150 years to recover. This management tool may reduce potential snags by fire suppression or by removal of burned trees for safety standards. In some cases fire suppression for some small fire outbreaks would save old growth or existing snags.

Wildfires may be allowed to burn in the Clear Creek Roadless Area; however there is no way to determine the extent of fires that may occur. A burn may create highly suitable woodpecker habitat for up to a decade. Fire suppression would continue outside the Roadless Area where snags would be created primarily through insect and disease outbreaks. These would be available for use by woodpeckers. The direct and indirect effects of the action alternatives are expected to maintain suitable woodpecker habitat both within and outside of treatment areas. Fire suppression and allowing fire to burn in the Roadless Area combined with the retention of old growth and other retention areas would maintain habitat for black-backed woodpeckers. No cumulative effects are therefore expected from the Action Alternatives when combined with fire suppression.

The Forest Plan Amendment for old growth and snags would provide more structure than Forest Plan standards to support some black-backed individuals foraging in old growth or riparian areas within the project area. Forest Plan standards being met by the project for the black-backed woodpecker include Standards 1, 7, and Page II-6 from table 3-43.

Alternative A proposes no actions, so this would create No Impact on the woodpecker. Alternatives B, C, and D, a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* for the black-backed woodpecker. Design criteria and unit layout would manage for snag retention or recruitment for the next 10 to 25 years after the project is completed.

3.12.5.3.3 Fisher

The fisher is a Region 1 sensitive species, a Forest MIS, and an Idaho species of greatest conservation need (IDFG 2005). There have been 11 fisher observations (2 observed tracks, the rest are individuals or trapping records) reported within five miles of the Analysis Area between 1982 and 2005. Two occurred outside the northeast corner of the Project area. The scattered distribution of these reports indicate well-distributed habitat.

Fishers are associated with mature coniferous forests and specific structural elements—particularly large trees and coarse woody debris (Ruggiero et al. 1994). They inhabit mesic, coniferous forest between 3,500–6,000 feet elevation, although habitat preference changes with season, age, and sex (Badry 2004; NatureServe 2012). Fishers avoid open ground (Buskirk and Powell 1994; Powell 1993) and have a preference for structurally complex areas with multiple canopy layers, including understory shrubs and large amounts of woody debris (USDA Forest Service 1998b, Powell 1993). Ruggiero et al. (1994) concluded that riparian zones, high elevation old growth grand fir, and subalpine fir stands are important habitat components for fisher (Powell 1993). Fishers appear able to use "many different habitats for hunting as long as these areas provide overhead cover at either the stand or patch scales" (Weir and Harestead 2003, p. 9). Sufficient overhead cover in foraging habitat may be provided by either tree or shrub cover. Although fisher home ranges are consistently characterized by moderate to high proportions of mid- and late seral forests, there are few overarching patterns of selection for particular seral conditions or species compositions (Sauder and Rachlow 2014). Raley et al. (2012) hypothesized that when fishers select home ranges, they benefit from including a diverse array of available forest conditions by increasing access to a greater diversity and abundance of prey species while still attaining habitat features important for reproduction and thermoregulation. Sauder and Rachlow's (2014) results are consistent with this contention.

In a study on the Nez Perce National Forest in the Elk City area from 1985 to 1988, most fisher observations were in mesic grand fir habitat types (Jones 1991). Grand fir and Engelmann spruce dominated stands the fishers used in summer. Similarly, in winter fishers used grand fir, Engelmann spruce, and lodgepole pine dominated stands. Summer habitat had a relatively high component of moderate to large diameter Engelmann spruce, large diameter Douglas-fir, and pacific yew. Fishers avoided stands with a strong lodgepole or ponderosa pine component. Winter habitat included stands with a relatively high basal area in Douglas-fir and lodgepole pine. Fishers also strongly selected wetland forest types, with selection for forested riparian habitats evident at several scales in summer and winter (Jones 1991). In summer, 50% and 75% of observations were within 49 and 75 feet of water. Moving across landscapes, fishers commonly used forested riparian areas, where preferred resting habitat and prey may be more available than in surrounding habitats.

In north-central, Idaho, home ranges contained 53% mature/old growth stands on average. In summer, 90% of observations were in mature/old growth forest. In winter, 54% were in mature/old growth and 46% in young forest (Jones and Garton 1994). The authors speculated that the shift in diet between the seasons was likely due to prey availability. Availability of large diameter logs (>21 inches dbh) appeared to be particularly important in winter habitat selection. Mature/old growth stands were used extensively for resting, while hunting occurred in a range of successional stages, including young sapling and pole forest. For resting, fishers preferred stands with canopy cover greater than 60% and for hunting they preferred canopy cover greater than 80%. They avoided areas with less than 40% canopy closure and drier habitats.

There are 10,037 acres (23%) of currently suitable summer habitat (mature/ old forest) and 13,570 acres (31%) of winter habitat (seedling/sapling/young forest) for fisher in the analysis area. Though more acres of mature forest exist in the project area, the available habitat focuses on a combination of tree canopy cover greater than 40%, an age class of 100 year or older, as well as the diameter class shown in Table 3-45.

Population Trends: Fishers have a global ranking of G5 (secure) and a state rank of S1 (critically imperiled). Fishers are distributed throughout most of their historical territory in the Clearwater drainage, although the population remains at a low level (Buskirk and Ruggiero 1994). Samson (2006b) indicates 74,380 acres are required to maintain a viable fisher population in Forest Service Region One. Bush and Lundberg (2008) show over 440,000 suitable acres of summer habitat and over 700,000 acres of winter habitat occur on the Nez Perce National Forest. . For descriptions of the above acreages estimated by the authors, please refer to the paragraphs following Table 3-45.

Direct and Indirect Effects

Alternative A—No Action

This alternative would have no direct effects to mature or old growth habitat since no activities are proposed. Habitats would continue to be altered by natural events such as succession and insects/disease. Fire suppression would continue. Snag and large down wood habitat elements would remain available as trees die (and fall) from natural causes. A wildfire and/or insect and disease activity would leave greater numbers of snags and large down wood than exist now but would also reduce canopy cover. These more open areas would provide unsuitable conditions for fisher. Ongoing fire suppression may help maintain mature and older habitats on the landscape longer. Winter habitat would continue to be available across the analysis area. Connectivity across the landscape would continue to be provided by RHCAs.

Alternatives B, C, and D

As an MIS, fisher populations would be expected to continue to display population stability across the Nez Perce National Forest under Alternatives B, C, and D. Proposed regeneration harvest would simplify suitable fisher habitats in the short term (<50 years) by eliminating canopy cover and layering, reducing large down wood, and reducing standing snags in treated areas. Snags and down wood would be provided for over the long term (100 years or later) through tree retention design features: average 14-28 trees/acre; 9-14 of which would be snags or snag recuits. Canopy cover would increase to suitable levels after about 30 years. Proposed commercial thinning would have minimal effects by retaining enough structure and overstory canopy to be used by fisher. The Action Alternatives would reduce the likelihood of a large, intense fire. Fires have both positive and negative effects on fisher (as discussed under the No Action alternative).

Jones (1991) suggests that landscape scale habitat management should incorporate young- to mid-successional stages to provide habitat for prey species while retaining mature and late-successional habitats that provide important denning and resting habitat. The project has been designed to maintain all successional stages within the Project area, providing suitable habitat for fisher.

Alternatives B and C would conduct regeneration and improvement harvest on 580 acres (6%) of currently suitable summer habitat and Alternative D regenerates 438 acres (4%). Landscape burning occurs on 22 acres (0.2%) and would have similar effects to regeneration and improvement harvest activities. Retained trees, snags, and down logs in these areas would provide future habitat for fisher as the stands age. All action alternatives commercially thin 35 acres (0.3%) of summer habitat. Commercial thinning would reduce canopy cover to 40%–60% and would maintain a canopy cover level suitable for fisher use.

Alternatives B and C conduct regeneration and improvement harvest on 1,124 acres (8%) and 1,646 acres (12%) of fisher winter habitat respectively. Alternative D does not propose these types of harvest. No landscape burning is planned on fisher winter habitat under any alternative. Alternative B, C, and D commercially thin 2,210 acres (16%), 1,731 acres (13%), and 2,013 acres (15%), respectively. The effects of regeneration/improvement harvest and commercial thinning on winter habitat are the same as for summer habitat.

Habitat quality in currently suitable summer and winter fisher habitat would decrease in all Action Alternatives. Alternatives C would convert 18% of mature habitat to early seral conditions. Alternative B converts 16% and Alternative D coverts 4%. No harvest would occur in verified old-growth or RHCAs under any alternative. These areas would continue to provide suitable habitat and well as connectivity between suitable habitat patches on over 30% of the landscape. Insects and disease events would continue across the landscape causing tree mortality. These would produce snags and large down wood used by fishers for denning and resting. Commercial thinning would have minimal effects on up to 16% of fisher habitat. Summer and winter fisher habitats would remain well distributed and available under all alternatives. Trends in fisher populations at the local and forest scale would not be affected by project activities due to the wide availability of suitable habitats.

Cumulative Effects

The cumulative effects area for fisher is the 43,700-acre project area. The time frame for cumulative effects is 100 years which is the approximate amount of time required for stands to develop into a mature or older vegetative state and snags to develop into a condition that provides habitat for old growth and snag dependent species.

Alternative A—No Action

There would be no negative cumulative effects from this alternative since no actions would occur. The effects of fire suppression are the same as those discussed under the direct and indirect effects of the No Action alternative.

Alternatives B, C, and D

Fire suppression could have positive effects on fisher habitat by limiting fire in mature and older forests. The cumulative risk to fisher habitat from the action alternatives is considered low because the project will meet Forest Plan standards for old growth and snags, PACFISH buffers will be applied in riparian areas, and other mature stands that would provide fisher habitat will remain after treatment. A 2015 research article found that core use areas within fisher home ranges were consistently composed of moderate amounts of both high canopy cover forest and moderate landscape edge density. These results support the hypothesis that habitat heterogeneity and diversity are important to fishers and influence habitat selection within home ranges (Sauder and Rachlow 2015). Early seral forest would provide winter forage habitat for fisher. Woody debris would continue to be recruited as trees age and die. The cumulative effects concerning this project would be insignificant and short-term (about 10 years) for the fisher.

Future foreseeable projects, the Eastside Allotment and the Brown Springs culvert replacement, would not affect the fisher or its habitat. The Clear Ridge Road decommissioning would create disturbance to individual fishers. Upon completion of the project, the obliterated road prisms would produce vegetation in 3-5 years. Trees would be providing winter foraging habitat in 20 to 30 years. As trees mature to around 100 years of age, fisher habitat for all seasons would be available. The private land harvest would reduce potential fisher habitat. It is not known if the future intent for the land is to return to a forested condition. Foreseeable projects may disturb fishers by machine and human presence. Forest Plan standards being met by the Clear Creek Integrated Restoration Project for the fisher include Standards 1, 7, FW 1, and Page II-6 from table 3-43.Alternative A would have *No Impact* on the fisher or its habitat. For Alternatives B, C, and D, the determination is a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* for the fisher.

3.12.5.3.4 Flammulated Owl

This species is a Region 1 sensitive species and an Idaho species of greatest conservation need (IDFG 2005). The flammulated owl is a small owl, considered a neotropical migrant, nests in tree cavities and preys on insects (Hayward and Verner 1994, Powers et al. 1996). The diet of this owl consists mostly of nocturnal moths and insects gleaned from open tree branches, taken on the wing, or picked up from the ground.

Idaho flammulated owl habitats are typically mid-elevation, mature or older open ponderosa pine and/or Douglas-fir forest (IDFG 2005). Groves et al. (1997) showed flammulated owls used "…stands with mature to old ponderosa pine and Douglas-fir, multiple canopy layers, low tree densities, moderate to low canopy closure, and moderate ground cover". They prefer habitat on warm, south facing slopes. Clear Creek has limited habitat for these birds; about 236 acres of suitable habitat in the analysis area. This habitat is scattered and occurs in relatively small patches. Better quality habitat occurs primarily on breaklands along lower Clear Creek.

Samson (2006a) states that few estimates of territory size are available for the flammulated owl. Some researchers suggest that the owl's habitat will decline due to fire suppression (Groves et al. 1997, Wright et al. 1997, Linkhart and Reynolds 2007), as suppression allows Douglas-fir trees to outcompete shade intolerant trees that are important for the owl. Another set of researchers (Nelson et al. 2009) suggest that flammulated owl habitat has declined over a period of 50 years. Their basis included the Jeffrey pine (which is not found on the Nez Perce Forest), and 10 western states that are outside of Idaho. The latter is not a feasible study to lend conclusions as to potential owl habitat conditions on the Nez Perce National Forest.

Population Trend: In Idaho, the flammulated owl has a state rank of S4 (apparently secure). There is no population trend data for Idaho; however the Forest Service Region 1 conducted flammulated owl surveys across Montana and Idaho. Sixty-nine owls were detected on Nez Perce Forest. The 2005 effort included surveys in the nearby South Fork Clearwater River. Additional surveys were conducted in 2008 in Region 1, including on the Forest. Flammulated owls were detected on 55% of the routes with the Nez Perce National Forest having the highest proportion detections.

A study conducted by Samson (2006a) found no scientific evidence that the flammulated owl is decreasing in numbers in the Northern Region of the Forest Service. Samson (2006b) elaborates on a 6-step decision tree to conclude that no data suggest the flammulated owl would be susceptible to change in its habitat as affected by forest management following a consistent and quantitative approach. (Samson 2006). Bush and Lundberg (2008) used FIA date to estimate that the Nez Perce Forest has about 39,579 acres. A more detailed description of regional modelling is found below Table 3-45. The district biologist used a forest model for the owl, then queried for tree ages greater than 100 years in order to establish mature habitat the bird prefers. Modelled potential habitat for the owl based on the criteria in Table 3-45 estimated 236 acres in the project area.

There were 2 confirmed sightings 4 miles north of the Project area in 1995 (IDFG 2010).

Flammulated owl presence in the Project area has not been confirmed. Flammulated owls are difficult to detect because they are nocturnal and have low population densities.

Direct and Indirect Effects

Alternative A—No Action

No activities would occur under this alternative. Habitat would continue to be sparse, scattered, in large and small patches. Habitat quality and quantity would decrease as tree density in ponderosa pine and Douglas-fir habitats increase due to a lack of disturbance and fire suppression. Forest conditions would trend away from preferred open grown, old-growth habitats. The increase in tree density would also increase the risk of stand-replacing fire in potential habitats. This type of fire would lead to habitat loss. Nesting habitat would increase slowly as a result of insect and disease outbreaks where fire does not occur.

Alternatives B, C, and D

Regeneration harvest would occur on 34 acres of suitable owl habitat under Alternatives B and C, and 27 acres under Alternative D. Harvest may remove snags suitable for nesting and roosting, due to safety concerns for personnel involved in timber or fire operations. It would also reduce the number of canopy layers and ground cover which would improve foraging opportunities for the owl. Total impacts to the owl's potential habitat would be 14% from Alternatives B and C, and 11% from Alternative D.

Design features would retain 14-28 tpa, of which an average of 9 to 14 snags or recruits per acre would be retained in units of the warm and dry habitat type groups (refer to Forest Plan Amendment 42). The retained trees would be in clumps or scattered individual trees. All legacy trees would be retained. Such trees would provide nesting and perching habitat after project implementation and into the future as stands become denser and develop multi-layered canopies. Wright et al. (1997) found that flammulated owls were present in approximately half of the selectively logged stands in her study area south of Missoula, Montana. Howie and Ritcey (1987), in a British Columbia study, found that most owls occurred in mature and old stands of Douglas-fir with 35%–65% canopy closure that had been selectively logged 2 to 3 decades prior.

Improvement harvest would occur on 4 acres of potential owl habitat under all the action alternatives. Benefits resulting from harvest would include making ponderosa pine stands more resilient to wildfire, reducing the Douglas-fir and grand fir component, and managing large ponderosa pine habitats in an open understory condition. Canopy cover would be reduced, which provides for better owl foraging opportunities. However, with only 4 acres (<1%) planned in flam owl habitat, the benefits are immeasurable. An example of treatments in or around owl habitat for Alternative C can be seen as a map in Appendix F.

No thinning or burning would occur in potential flammulated owl habitat under any of the action alternatives. However, about 2,000 acres of landscape burning is proposed in all action alternatives that would occur outside of the owl's current habitat. Potential foraging habitat for the flammulated owl may become available as shrubs grow back. Flowering stages of the understory would attract invertebrates that the owl would feed on.

The proposed activities concerning regeneration harvest would reduce nesting habitat. However, forage habitat may improve as shrubs take hold. The latter provide habitat for insects that are prey for the flammulated owl. All treatments would improve the resilience of ponderosa pine and create the forest structure necessary to support the flammulated owl over time. The proposed activities are not likely to alter the population trend at the project or forest level due to the mostly positive effects associated with them. The negative effects are expected to be limited and there is no sign of decline at the regional level (Samson 2006a). Owls would also continue to be able to use the treated areas primarily for foraging.

Cumulative Effects

The cumulative effects area for flammulated owl is the 43,700-acre project area. The time frame for cumulative effects is 100 years which is the time it takes to develop large snags and trees used for nesting.

Alternative A—No Action

The direct and indirect effects of this alternative when combined with fire suppression could lead to negative cumulative effects on flammulated owl in the event of a wildfire. Snags would be created but canopy cover would be reduced. Determining the extent and probability is not possible; however 50% of the Project area is currently susceptible to stand replacing fire. Some snags adjacent to roads open to public motorized access would be cut for firewood gathering.

Alternatives B, C, and D

There would be both positive and negative cumulative effects associated with the action alternatives. The project would reduce the amount of flammulated owl habitat by 11% to 14% through regeneration harvest in the mid-term (50–100 years Improvement harvest would affect less than 1% of habitat in all alternativers. Disturbance to owls would occur in units and roads where activities and noise from humans and machines are present. The activities would occur in the daylight hours, and would not impact the owl’s foraging at night.

Almost 2,000 acres of landscape burning is proposed. Though none of it is currently in flammulated owl habitat, it offers potential to create more habitat for the owl. The burning would reduce canopy cover and favor older tree species with thick bark, such as Ponderosa Pine and Douglas-fir. As the canopy is decreased, more shrubs would have potential to compete. These flowering plants would attract invertebrates that the owl forages for.

As far as foreseeable projects, the culvert replacement and range allotment projects would not impact the owl. Additionally, the Clear Ridge road decommissioning is unlikely to knock down large trees preferred by the owl. The private land harvest may or may not impact habitat, but the prescription and volume is not known.

Fire suppression would maintain dense stands in untreated areas reducing the quality of owl habitat and increasing the risk of stand replacement fire in those areas. The level of cumulative effects cannot be assessed but are expected to be negligible. Forest Plan standards being met by the project for the flammulated owl include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Alternative A (no action alternative) would have *No Impact* on the flammulated owl or its habitat. The Action alternatives determination is *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* for the flammulated owl.

3.12.5.3.5 Gray Wolf

Gray wolf is a Region 1 Sensitive species. Wolf habitat spans a broad range of elevations and habitat types. Key habitat components include: a sufficient year-round prey base of ungulates and alternate prey; suitable, somewhat secluded denning and rendezvous sites; and sufficient space with minimal exposure to humans (USDI Fish and Wildlife Service 1987).

The Pilot Rock wolf pack uses the Analysis Area. One rearing location was documented in 2007, and wolves with pups were observed in 2007, 2008, and 2010, where two rendezvous sites have been confirmed. No den sites were identified. Two wolves were captured in Hoodoo Creek in 2007 and wolf tracks were observed in 2011. The Analysis Area provides a variety of suitable habitats for wolves and their prey.

Ungulates comprise more than 90% of wolves' diets from spring through winter in the Rocky Mountains. Mule and white-tailed deer, elk, and moose are the principal prey species (USDI Fish and Wildlife Service 1987). Elk provide the primary prey base for wolves. Maintaining elk habitat effectiveness (EHE) above minimum Forest Plan standards, providing elk security areas above minimum recommendations and managing winter range to enhance elk forage productivity and quality would provide a sufficient prey base to sustain wolf populations according to State objectives for the Dworshak and Lolo Wolf Management Zones (WMZs).

Population Trends: The gray wolf recovery plan (USDI Fish and Wildlife Service 1987) established a recovery goal of 10 breeding pairs for three consecutive years in central Idaho. There are currently 101 wolf packs in Idaho as of 2011. Recovery objectives have been met and exceeded. Hunting and trapping of wolves for control purposes has been approved by court decisions, allowing natural resource agencies and the public opportunities to take wolves.

Direct and Indirect Effects

Alternative A—No Action

There would be no direct or indirect effects to denning or rendezvous sites. Habitat security would remain unchanged and high (see Elk section). Wolves would continue to have abundant prey sources. Continued fire suppression efforts may actually increase the risk for wildfire. Large insect or disease infestations or wildfire would reduce hiding cover for wolves and their prey, but forage for big game may increase over a period of

20 years. This would be a short-term benefit for the wolf in the analysis area. Foraging habitat for elk may decline in these areas after 20 years as a result of forest succession.

Alternatives B, C, and D

The proposed activities would have no direct or indirect effects on known rendezvous sites since no activities are proposed in or near them.

All Action Alternatives would increase forage for elk. Harvesting and landscape burning would reduce tree canopy cover and promote the growth of native shrub species important for elk forage. The amount of forage from regeneration and improvement harvest would increase by 7%, 10%, and 5% under Alternatives B, C, and D, respectively. Forage improvements would last for about 30 years. Hiding cover would decrease by the same amounts in the treated areas and would be recovered in about 20 years. Landscape burning on 3% of the Project area would promote forage growth on winter range in all Action Alternatives. Elk habitat effectiveness would decline during implementation of the Action Alternatives, but would return to levels at or above Forest Plan objectives (see Elk section).. Increases in elk forage, and therefore forage opportunities for wolves, are expected on 3% to 20% of the Project area. Reduced hiding cover would improve the potential hunting success for wolves in treatment areas.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area and includes seven elk analysis units. The cumulative effects timeframe is 20 years, as it would take this long for regeneration harvest and burned areas to develop into hiding cover. Cumulative effects were assessed using EHE because elk are the main prey base for wolves. Elk security was not addressed since there are no changes to it as a result of any of the alternatives.

Alternative A—No Action

The effects of this alternative are the same as those described under the direct and indirect effects. There would be no cumulative effects since there are no proposed actions with this alternative.

Alternatives B, C, and D

The cumulative effects of the action alternatives on EHE and wolves would be both positive and negative. Fire suppression would reduce forage quality and quantity by not allowing fires to burn; however proposed activities would increase forage by 3% to 20% depending on the alternative. The level of potential positive or negative cumulative effects cannot be determined as fire severity and size is not predictable. Ongoing or foreseeable projects may disturb wolf individuals, but will not remove habitat that would affect dens, wolf movement or forage opportunities. Forest Plan standards being met by the project for the wolf include Standards 1, 6, 7, 10, 13, FW 1, and Pages II-5 & 6 from table 3-43.

Alternative A would create *No Impact* on the wolf. For Alternatives B, C, and D, the determination is a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species*.

3.12.5.3.6 Mountain Quail

This species is a Region 1 Sensitive species and an Idaho species of greatest conservation need (IDFG 2005). The species is on the fringe of its western range in Idaho and on the Forest (Idaho Partners in Flight 2000). Preferred habitat is dense thickets of rose, hawthorn, black currant, serviceberry, elderberry, blackberry, chokecherry and willow (Wisdom et al. 2000, Gutierrez and Delehanty 1999, Heekin and Reese 1995). They also use densely vegetated draws, shrubby understory and forest and meadow edges in open ponderosa pine and Douglas fir (Heekin and Vogel 1995). In Idaho, mountain quail habitat was dominated by tall shrubs that averaged 10 feet in height with an average canopy density of 45% that were within a few hundred feet of water. They occur most frequently in draws with shrub galleries along the breaks and secondary drainages of the Snake, Salmon, and Clearwater Rivers. Nests are primarily located within 200-300 yards of water since chicks require water soon after hatching (Johnsgard 1973; Wisdom et al. 2000). Known, recent locations on the Forest are in dry, low elevation, face drainages of the Salmon River. Mountain quail habitat is more commonly found on private lands at lower elevations in the Clear Creek watershed near Kooskia, Idaho (about 10 miles northwest of the Analysis Area) and along the lower Selway River canyon. Mountain quail historically occurred in the Project area.

Mountain quail breed and winter in warm and dry shrub-dominated communities (IDFG 2005). Healthy shrub-dominated riparian areas are important features of suitable habitat and provide corridors for quail to move to higher elevation breakland habitat in summer.

There are 187 acres of currently suitable early successional mountain quail habitat in the Project area. All if it is within VRU 3 in the Clear Creek Roadless Area and occurs along stream breaklands. VRU 3 contains 6% young seral conditions and is well below the desired condition of 15%–25%. A small covey of mountain quail were observed 1 mile from the northeast boundary of the Project area in 1997 (IDFG 2010); however the observations were not confirmed.

Population Trend: Mountain quail populations have been declining in the intermountain west for the past several decades (Gutierrez and Delehanty 1999), and the Idaho population has experienced the same pattern of decline since the 1930s (Heekin and Reese 1995). Mountain quail occur along the Snake, Boise, Clearwater, Salmon, and Little Salmon River canyons (Heekin and Reese 1995). Remaining habitat areas are fragmented and populations often exist in isolated islands (Wisdom et al. 2000). Habitat in the Salmon River near Riggins, Idaho, supports a stronghold population.

Direct and Indirect Effects

Alternative A—No Action

Current habitat would become unsuitable over time as tree density and canopy cover increase and shade out shrubs. Habitats may become more susceptible to stand-replacing wildfire, which could threaten individual birds, yet may create additional habitat for quail.

Alternatives B, C, and D

Proposed landscape burning would increase mountain quail habitat by 19% (35 acres). Burning would reduce the Douglas-fir and grand fir component in ponderosa pine stands, retaining large ponderosa pine and Douglas-fir trees, and promoting shrub growth. Landscape burning would help maintain open conditions; however birds may be disturbed by proposed activities. The risk is considered low given the small amount of proposed treatment acres and the expected low number of birds in the area.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 20 years because this is when shrub habitat conditions would begin declining.

Alternative A—No Action

There could be minor cumulative effects from this alternative. No activities would be conducted to improve quail habitat and fire suppression would prevent the development of suitable habitat resulting from wildfire.

Alternatives B, C, and D

The action alternatives would improve habitat quality through the use of prescribed fire. Proposed treatments may increase the potential for allowing natural fires in the Roadless Area, which would be beneficial to quail. Fire suppression would continue outside of the Roadless Area, with little habitat improvement for quail. Some positive cumulative effects to mountain quail would be expected, however the limited amount of treated acres may not create an increased trend in quail populations. Ongoing and foreseeable projects in the area would not affect mountain quail habitat. Forest Plan standards being met by the project for the mountain quail include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Alternative A would have *No Impact* on mountain quail or its habitat. For Alternatives B, C, and D, the determination is a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* of the mountain quail.

3.12.5.3.7 North American Wolverine

On February 4, 2013, the USFWS proposed listing the Distinct Population Segment (DPS) of the North American wolverine (*Gulo gulo luscus*) in the contiguous United States as a threatened species under the Endangered Species Act (ESA). After further review of all available scientific and commercial information, the USFWS subsequently withdrew that proposal, and published their determination on August 13, 2014, that adding the North American wolverine occurring in the contiguous United States as a distinct population segment to the Lists of Endangered and Threatened Wildlife and

Plants was not warranted (79 FR 47522). As a result of this action, the wolverine automatically returns to the R1 Sensitive Species list, and is analyzed as such.

Wolverines occur naturally in low densities, and current population levels and trends are not definitely known (FR78 7868). However, there is evidence that their population is increasing (FR 79 47524) and that wolverines are expanding both within areas currently occupied as well as suitable habitat not currently occupied (FR 79 47536).

Wolverines are not tied to any specific vegetative or geologic habitat features—they use a variety of habitats, including those altered by management activities and fire and can persist in areas with dispersed or developed summer or winter recreation activities. Wolverine occurrence is linked to the presence of deep, persistent snow (as modeled by Copeland et al. 2010) across their range, except for denning, which appears to have an obligate relationship with the deep persistent snow zone. The weasel has a large home range and moves through altered landscapes.

Direct and Indirect Effects

Alternative A—No Action

There would be no direct or indirect effects under this alternative since no activities would occur.

Alternatives B, C, and D

Habitat models show that approximately 6,257 acres in the project lie within a persistent snow area (an attribute of wolverine habitat). Proposed harvest units within potential wolverine habitat include commercial thin (about 535 acres), pre-commercial thinning (140 acres) and regeneration in about 50 acres: about 12% of the animal’s potential habitat in the project area. These activities would not affect the persistence of the snow in the area. No activities would occur in talus or scree fields, and no harvest would occur in alpine meadows. No records of wolverine observations were apparent in databases.

Cumulative Effects

Alternative A would not create any cumulative effects, and therefore will have *No Impact* on the wolverine.

Human activities in the Clear Creek Integrated Resource Project would create disturbances to any wolverine which may be in the project area. These disturbances would be associated with land management activities such as forestry, or fire/fuels reduction activities. They would include human and mechanical activity, noise, prescribed burning and other management activities. At the local level, there may be impacts to individual wolverines, but population level effects are unlikely because: (1) wolverines can travel long distances and are not adverse to crossing open spaces; therefore, if temporarily displaced, they can easily move into the large areas of undisturbed habitat that surrounds the project; and (2) any habitat impacted will not be rendered unsuitable for wolverines post-project and will continue to contribute toward maintaining wolverine viability (FR 47539). The project activities would not affect the persistence of the snow in the area. Activities would begin in June, after most snow has melt and the roads can be used without soil damage. Ongoing or foreseeable projects may disturb individual wolverines in the area, but would not affect their habitat. Forest Plan standards being met by the project for the wolverine include Standards 1, 6, 7, 10, FW 1, and Pages II-5 & 6 from table 3-43.

The Alternatives B, C, and D of the Clear Creek Integrated Restoration Project *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* North American wolverine.

3.12.5.3.8 Pygmy Nuthatch

This species is a Region 1 sensitive species and an Idaho species of greatest conservation need (IDFG 2005). In Idaho, the pygmy nuthatch has a state ranking of S1 (critically imperiled). They are residents in mountain conifer woodlands, often in open woodland with large trees (Baicich and Harrison 1997). In Idaho, they are mainly found in pine forests and woodlands, especially ponderosa pine. They prefer older, open ponderosa pine habitat with <70% canopy cover. Nests appeared most often in cavities excavated by other birds (McEllin 1979). Raphael and White (1984) and Brawn and Balda (1988) found 100% of nests were in snags, not live trees.

Modelled habitat from the criteria in Table 3-45 depicted 581 potential acres of habitat in the Project area for the pygmy nuthatch.Habitat is scattered in small patches generally under 15 acres in size. . Only 5 patches ranging from 10-14 acres were present; with the remaining 325 patches containing less than 10 acres in size. Home ranges of nuthatches range from 0.5 to 21 acres (Ghalambor and Dobbs 2006). This species requires snags for nesting and forages on pine seeds and insects extracted from tree bark. Two pygmy nuthatches were recorded in the Analysis Area during a breeding bird point count survey in 1994.

Population Trend: Rosenberg (2004) and Partners In Flight (PIF) estimate approximately 5,000–5,300 individuals on a year-round basis in Idaho. BBS data indicate a positive population trend of >1.5% change per year from 1966–2010 for the northern and northcentral Idaho pygmy nuthatch population.

Direct and Indirect Effects

Alternative A—No Action

Suitable habitat would decrease in the Project area over time as tree density and canopy cover increases with forest succession. Ponderosa pine habitats would continue to be encroached on by shade tolerant Douglas-fir and grand fir, further limiting suitable habitat. Fire suppression would limit the creation of new habitat. Snags would remain across the landscape and may increase from aging or diseased stands. This would provide nesting habitat for nuthatches. Existing young pine plantations would not provide suitable habitat for about 100 years.

Alternatives B, C, and D

Approximately 2,000 acres in all alternatives are proposed for landscape burning: most of it in currently unsuitable habitat for the pygmy nuthatch. This treatment would create suitable habitat by reducing Douglas-fir and grand fir, retaining large legacy trees, creating snags and maintaining ponderosa pine habitats in an open understory condition. Potential disturbance to the pygmy nuthatch is similar to what has been mentioned in the Environmental Consequences. Snags that are adjacent to public roads that allow motorized access may be lost from woodcutters. However, all temporary roads will remain closed to the public access during operations, and decommissioned upon completion of the project.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 100 years because it would take this long to develop large snags and trees used for nesting after regeneration harvest.

Alternative A—No Action

The direct and indirect effects of this alternative when combined with fire suppression could lead to negative cumulative effects on pygmy nuthatch in the event of a wildfire when older forest are burned. Snags, however, would be created and would be available for future nesting. Determining the extent and probability of fire effects is not possible; however 50% of the Project area is currently susceptible to stand replacing fire.

Alternatives B, C, and D

The action alternatives would reduce the amount of nuthatch habitat by 11% to 14% through regeneration and improvement harvests. Landscape burning could more than double current foraging habitat for the nuthatch in the affected areas where this occurs. Many other patches of suitable habitat are adjacent to the proposed burn units, which would offer foraging opportunities in 3-10 years for individual nuthatches that migrate to these patches.

All regeneration units would be replanted with shade intolerant species, including ponderosa pine. In about 80 years, these trees would be of the age and structure to provide potential habitat for the nuthatch.

Fire suppression would maintain dense stands in untreated areas reducing the quality of nuthatch habitat and increasing the risk of stand replacement fire in those areas. Fires would have short term negative but long term positive effects. Ongoing and foreseeable projects would disturb nuthatch individuals in the area, but no harvest of their habitat would occur. An exception may be the private timber harvest, as the Agency has no information on the prescription the owner plans to implement. Firewood cutting would continue to occur near roads where snags and public motorized access meet. Forest Plan standards being met by the project for the pygmy nuthatch include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Alternative A would not affect the bird with human activities, therefore it is determined as *No Impact* on the pygmy nuthatch or its habitat. For Alternatives B, C, and D, the determination is a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species*.

3.12.5.3.9 Ring-necked Snake

This species is a Region 1 sensitive species and an Idaho species of greatest conservation need (IDFG 2005). Ring-necked snakes can be found in forested, brushy areas or open hillsides that have rocks, logs, talus or other debris for cover and they may use microhabitats that are moist (Storm and Leonard 1995). In west-central Idaho they are typically found adjacent to perennial rivers or streams in grassland or forested habitats (IDFG 2005). The animal is nocturnal and hides underground or under surface cover (wood, rocks) during the day- making detections difficult. They feed on small invertebrates. An unrecorded observation of a ring-necked snake 5 miles north of the Project area was made in the 1990s. Similar elevations and drier vegetation types occur in the Analysis Area making it possible that these snakes are present in the area.

There are 3,030 acres of potential ring-neck habitat on the low elevation breaklands (VRU 3) where grasslands, open dry forest, and dry and moderately moist forest provide suitable conditions. Roughly 730 acres occurs within PACFISH RHCAs.

Population Trends: The ring-necked snake has a global rank of G5 (secure) and an Idaho State rank of S2 (imperiled). Current population and trend are unknown.

Direct and Indirect Effects

Alternative A—No Action

Fire suppression would continue under this alternative and habitats would become denser, creating conditions that would increase the risk of stand-replacing fire. Wildfires can directly harm ring-neck snakes and reduce their habitat. Approximately 20 years after a fire, beneficial effects would include snag recruitment and subsequently large down wood recruitment which creates habitat for ring-necked snakes. Currently 50% of the Project area is susceptible to stand replacement fire.

Alternatives B, C, and D

Timber harvest and landscape burning activities can cause direct mortality through contact with fire, machinery, or yarded logs. The effects on direct mortality cannot be estimated, but given the lack of observations and the use of protected riparian areas as habitat, the risk is expected to be low. Riparian habitat used by snakes would not be affected due to PACFISH buffer implementation.

Regeneration harvest would treat 66 acres (2%), 177 acres (6%), and 27 acres (1%) of suitable habitat under Alternatives B, C, and D respectively. Commercial thinning would treat 236 acres (8%), 125 acres (4%), and 171 acres (6%) of suitable habitat respectively. Improvement harvest would treat less than 1% under all alternatives. Harvest activities would remove trees that would have eventually become downed wood and suitable habitat for snakes. Regeneration harvest would remove the most potential habitat compared to other treatments. Snags and standing live trees as well as downed wood would, however, be retained in all harvest units which would provide limited current and future habitat for snakes. Talus slopes and rock outcrops used by snakes would not be affected. Opening the tree canopy would stimulate shrub growth which could increase invertebrate production and therefore foraging opportunities for ring-necked snakes.

Landscape burning would treat 191 acres (6%) of suitable habitat under all alternatives. The effects to ring-necked snakes would vary depending on fire intensity. Low intensity areas are expected to have no effects while high severity areas could cause direct mortality to snakes. Beneficial effects would be the increase in downed wood material (suitable habitat) 5 to 10 years after the burn when snags fall.

Grassland restoration activities occur on 0.1% of suitable habitat and would have no effect on this species. The overall negative effects to ring-necked snakes from proposed harvest and burning activities is expected to be low due to the retention of trees and downed wood in treatment areas and the retention of PACFISH buffers. No change to population trends of ring-neck snakes would therefore be expected from proposed activities.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 20 years because this is the time when snags would to start falling in treated units creating habitat for ring-neck snakes.

Alternative A—No Action

There would be no direct effects to ring-necked snakes from this alternative. Potential indirect effects include increased stand densities resulting from fire suppression and higher risk of stand replacing fire. This could result in direct mortality of snakes, though individual snakes would seek shelter under downed wood, rocks or talus slopes. Both positive and negative cumulative effects would be expected from this alternative as previously discussed. The levels are expected to be low due to the limited amount of potential habitat and effectiveness of fire suppression.

Alternatives B, C, and D

Cumulative effects to ring-neck snakes are expected to be both positive and negative and are the same effects as those discussed in the direct and indirect effects section. No quantitative estimate of cumulative effects can be provided since the number of potential fires and their size cannot be predicted. Harvest and landscape burn activities would reduce the risk of crown on 7% of the project area and 17% of VRU 3. Fire suppression would continue outside the Clear Creek Roadless Area (which is 28% of VRU 3). Naturally ignited fires in the Roadless Area may be allowed to burn after harvest and burn treatments are completed. This would allow for natural process to continue on 2,180 acres (72%) of VRU 3 which would be both beneficial and detrimental to ring-necked snakes depending on fire severity and size. Foreseeable projects would have no impact on snake habitat. Forest Plan standards being met by the project for the snake include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Alternative A would have *No Impact* on the snake or its habitat. Activities proposed in Alternatives B, C, and D, *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species of the ringneck snake*.

3.12.5.3.10 Western Toad

The western toad is a Forest sensitive species and an Idaho species of greatest conservation need (IDFG 2005). Western toads breed in temporary and permanent lakes, ponds, streams, and road ditches. They prefer shallow, warm areas with mud bottoms, and typically breed in May and June. Potential breeding and dispersal habitat occurs throughout the area along the network of riparian areas (10,700 acres, or 24% of the Analysis Area). Toads can be found from dry grasslands to moist subalpine forests, but optimal habitat is found in humid areas with moderate undergrowth (Nussbaum et al. 1983). They are largely terrestrial, but generally found within fair proximity to water. In Idaho, western toads are associated with almost all habitats within 1,600 feet of water.

Adult western toads are largely terrestrial and are very active at night. They have been known to move up to 1 mile from their breeding habitats, (Bartelt et al. 2004) often into upland habitats (Bull 2006). Toads selected south-facing slopes, preferred open sites to forested settings, and sites with high density of burrows, rocks, logs, or rootwads that provided cover (Bull 2006). Burned and harvested sites were not avoided by western toads in Bull's study. Guscio et al. (2007) found western toad occurrence increased after wildfires and they used severely burned areas. Use shifted from severely burned to moderately burned areas in the late summer likely as a result of more ground/canopy cover and higher soil moistures. There are 510 acres of potential upland toad habitat (<30% canopy cover and south aspects) in the Project area.

Population Trends: This toad has a state rank of S4, apparently secure. Population trends in Idaho are difficult to track due to a lack of baseline information, but they are well distributed (Engle and Harris 2001). The western toad is known to occur on the Forest but none have been reported in the Analysis Area.

Direct and Indirect Effects

Alternative A—No Action

There would be no actions, and therefore no direct effects to western toad upland habitat under this alternative. Upland openings preferred by toads may decrease as forest stands age and become denser. Fire suppression would minimize the amount of new openings that could be potentially created by wildfire. Downed wood used for cover currently exists and recruitment would continue as a result of tree mortality caused by insects, diseases, and potential wildfire.

Alternatives B, C, and D

Western toad breeding habitats are protected under all alternatives through no-harvest in RHCA implementation. A minor amount of habitat could be lost through road decommissioning and road improvement activities. Seasonal puddles occur along the edges of several roads as a result of poor road drainage. Long-toed salamanders were observed in 5 different roadside puddles (Smith, personal observation, 2010 and 2011). Tadpoles (potential toads or frogs) have been observed in similar pools but were not identified to species. Road improvements or decommissioning would improve drainage and limit the sediment to area streams. The effects to toads from these activities are considered low due to a low numbers of sites where roadside puddles occur.

Alternatives B and C would improve upland habitat for toads on 55 acres (11%) and Alternative D would improve 59 acres (12%) of suitable habitat respectively through regeneration harvest. Commercial thinning would occur on 4 acres under Alternative B and D. Harvest activities would decrease canopy cover while retaining downed wood for cover. No landscape burning would occur in suitable toad habitat. Proposed activities have the potential to cause direct mortality to toads due to tree falling and yarding, site preparation burning, and road work. The risk is expected to be low due to design features that minimize yarding corridors in harvest units and road work being completed during the drier parts of the year. No change in the population trend of toads is expected at the project level due to the limited amount of habitat being affected and the fact that treatments would slightly improve habitat quality for toads. All breeding habitat would be protected through the retention of RHCAs.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area. The cumulative effects timeframe is 20 years because this is the time when tree canopy cover would begin to close and reduce the quality of upland toad habitat.

Alternative A

The effects to upland toad habitat are the same as the direct and indirect effects discussed above. Cumulatively, this alternative may reduce upland toad habitat by natural canopy closures without disturbance by fire, wind or other factors. Fire suppression may affect the frequency and severity of future fires. This may be a benefit or detriment to the upland habitat for toads.

Alternatives B, C, and D

All action alternatives would maintain or increase the quality of upland habitat for toads. Treatments may allow for the use of naturally ignited fire in the Clear Creek Roadless Area which could create additional habitat. Fire suppression would occur outside of the Roadless Area limiting disturbance opportunities and toad habitat development there. The cumulative effects of the project would be beneficial (from harvest) to neutral depending on the amount of fire suppression activities. It is not possible to predict the amount of disturbance minimized by fire suppression. Ongoing and foreseeable actions in the area may impact western toads, the specifics of which are addressed in the respective project files. Cumulatively, the timing of all activities would avoid periods of breeding and the tadpole life stage. The toads would be capable of moving away from most hazards these other activities would generate. Forest Plan standards being met by the project for the toad include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Alternative A would have *No Impact* to the western toad or its habitat. For Alternatives B, C, and D, the determination is a *May Impact Individuals or Habitat, but not likely to result in a trend to federal listing or a reduced viability for the population or species* of the western toad.

3.12.5.4 Management Indicator Species

The National Forest Management Act of 1976 directs the U.S. Forest Service to identify and actively monitor management indicator species (MIS) to assess impacts of forest management activities on native biota within national forest lands (Code of Federal Regulations 1985). As defined by the National Forest Management Act, MIS may include species listed as (1) threatened, endangered, or rare, (2) having habitat requirements sensitive to management activities, (3) having social or economic value, and (4) serving as monitors for environmental factors, population trends of other species, or habitat condition.

The Nez Perce National Forest Plan (1987) uses the term wildlife indicator species, but the intent is the same as the national term. Five out of eleven MIS occur in the project area and are analyzed in the next few pages.

3.12.5.4.1 American Marten

The American marten is a Nez Perce Forest high elevation old growth MIS. Optimal habitat for marten has been described as mature/old-growth spruce-fir forest with at least 30% canopy cover, plentiful fallen logs and stumps, and a lush understory of shrubs and forbs. . Marten may be more associated with complex vertical and horizontal woody structure than with forests of a particular age, species, or overstory requirement (Chapin et al. 1997). Marten in north-central Idaho were found to use a variety of forest types in winter, but activity was highest in Engelmann spruce/subalpine fir stands with mesic habitat types, >30% canopy cover, and overstory age >100 years (Koehler et al. 1975, Koehler and Hornocker 1977). Mature lodgepole pine is also suitable in moist habitat types, and in areas of high precipitation, dense cedar-grand fir forests at lower elevations provide habitat for the marten as well (Koehler et al. 1975).

Due to the limitations of the vegetation models used for habitat analysis, the canopy cover was over-estimated (at ≥25%, instead of the suggested canopy cover of ≥30%). Approximately 20,305 acres of suitable habitat were calculated for marten in the Project area. Marten habitat is well distributed and connected throughout the area in the mid-to upper elevations.Population Trends: Total population size is unknown, but probably is at least several hundred thousand in the United States and the species can be regarded as secure (NaturServe 2012). Few data sets allow evaluation of population trends over long periods (Ruggiero et al. 1994). Samson (2006) indicates 3,500 suitable habitat acres are required to maintain a viable marten population in the Forest Service Northern Region. Bush and Lundberg (2008) show over one million suitable acres on the Forest. The state of Idaho considers the marten a "furbearer," and is legally trapped during the winter season.

There is a difference in computer model analysis used in determining marten habitat. Samson (2006a, 2006b) and Bush and Lundberg (2008) used models that would enable them to analyze potential marten habitat in the larger area of Montana and northern Idaho. Therefore, they used more tree species than the analysis conducted for the project area. The VMAP model used by the district biologist also has limitations: ranges of tree sizes and canopy cover that do not always capture a specific element, such as the 30% canopy cover or greater. Also, this model does not capture tree age, so a different model

(TSMRS-based) was used to gather this information. This action allowed the biologist to analyze potential habitat, according to the habitat criteria in Table 3-45, with a minor over-estimation on canopy coverage.

Direct and Indirect Effects

Alternative A—No Action

This alternative would have no direct effects to mature or old growth habitat since no activities are proposed. Habitats would be altered by natural events such as forest succession and insects/disease. Fire suppression would continue. Snag and large down wood habitat elements would remain available as trees die (and fall) from natural causes. A wildfire and/or insect and disease activity would leave greater numbers of snags and large down wood than exist now but would also reduce canopy cover. These more open areas would provide unsuitable conditions for marten. Ongoing fire suppression may be beneficial for this species because it can help maintain mature and older habitats on the landscape longer. Snags near roads open to public motorized access would likely be reduced by woodcutting.

Alternatives B, C, and D

Proposed regeneration harvest would simplify suitable marten habitats in the short term (<30 years) by eliminating canopy cover and layering, reducing large down wood, and reducing standing snags in treated areas. Marten tend to avoid large openings (Hargis et al. 1999, Moriarty et al. 2011, Potvin et al. 2000). Snags and down wood would be retained by the silvicultural prescription. Marten are known to rest or den in snags, slash piles, downed logs (Bull and Heater 2000). Canopy cover would increase to suitable levels after about 50 years. Proposed commercial thinning would have minimal effects, as the retained trees would provide structure and canopy coverage to marten. The Action Alternatives would reduce the likelihood of a large, intense fire. Fires have both positive and negative effects on marten (as discussed under the No Action alternative). Jones (1991) suggests that landscape scale habitat management should incorporate young- to mid-successional stages to provide habitat for prey species while retaining mature and late-successional habitats that provide important denning and resting habitat. The project has been designed to maintain all successional stages within the Project area which would continue to provide suitable habitat for marten.

Alternatives B and C would conduct regeneration and improvement harvest on 1,189 acres (6%) of currently suitable habitat and Alternative D regenerates 796 acres (4%). Retained trees, snags, and down logs in these areas would provide future habitat for marten as the stands age. All action alternatives commercially thin 40 acres (<1%) of marten habitat. Commercial thinning would reduce canopy cover to 40%–60% and would maintain a canopy cover level suitable for marten use. Ten acres of landscape burning would occur in marten habitat in all action alternatives.

Harvest units would create edge effects adjacent to untreated stands. Marten would likely avoid the new opened areas, but continue to conduct activities in preferred habitat that exists adjacent to or nearby the treated stands. Noise from machinery and human presence would disturb individual martens in or near treatment areas. For mitigation, current access closures would be maintained as part of the proposed project. Proposed road and watershed improvements, road to trail conversion, temporary road construction, and road decommissioning activities would not have an appreciable effect on marten or their habitat. There may be minor impacts to habitat from landscape or prescribed burning activities as individuals or clumps of trees may be torched, therefore opening the canopy and creating a mosaic landscape.

No harvest would occur in verified old-growth or RHCAs under any alternative. These areas would continue to provide suitable habitat and well as connectivity across over 30% of the landscape. Insects and disease events would continue across the landscape causing tree mortality. These would produce snags and large down wood used by martens for denning and resting. Marten habitat would remain well distributed and available under all alternatives. Trends in marten populations at the local and forest scale would not be affected by project activities due to the wide availability of untreated suitable habitats at the project and Forest level.

Cumulative Effects

The cumulative effects area for marten is the 43,700-acre project area. The time frame for cumulative effects is 100-150 years which is the approximate amount of time required for stands to develop into a mature or older vegetative state and snags to develop into a condition that provides habitat for old growth and snag dependent species.

Alternative A—No Action

There would be no negative cumulative effects from this alternative since no actions would occur. The effects of fire suppression are the same as those discussed under the direct and indirect effects of this alternative.

Alternatives B, C, and D

Fire suppression could have positive effects on marten habitat by limiting fire in mature and older forests. The action alternatives would modify from 4-7% of existing marten habitat.

Silvicultural prescriptions would retain 14-28 tpa, consisting of live trees and snags. Some of the retained clumps would offer structure for marten foraging or resting areas. Forest plan standards for snags would be met by these alternatives. The cumulative risk to marten habitat from the action alternatives is considered low due to the retention of old growth, PACFISH buffers, snag retention guidelines, and other mature stands that would provide marten habitat after treatment. Woody debris would continue to accumulate and be created as trees age and die. Martens would possibly be disturbed during the Brown Spring culvert replacement and the Clear Ridge road decommissioning; but that would only occur at sites of activity. Overall, the riparian work would mitigate damaged areas that produce sediment to streams and replace the area with vegetation. Forest Plan standards being met by the project for the marten include Standards 1, 7, FW 1, and Page II-6 from Table 3-43.

Under Alternative B, C, and D, *some impacts may occur to individuals or their habitat, but is not expected to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for the American marten.*

3.12.5.4.2 Northern Goshawk

The northern goshawk was identified as a Forest MIS for old-growth forest. Nesting habitat was chosen as the indicator as it is the primary limiting factor for goshawks and is represented by a much narrower range of vegetation structure and composition than the post-fledgling areas and forage area. Foraging habitat for goshawks may occur along the edges of open areas and is not considered limiting.

Goshawks use large landscapes, integrating a diversity of vegetation types over several spatial scales to meet their life-cycle needs (Squires and Kennedy 2006). In "The Northern Goshawk Status Review," the USFWS found that the goshawk typically uses mature forest or larger trees for nesting habitat; however, it is considered a forest habitat generalist at larger spatial scales (USDI Fish and Wildlife Service 1998). The USFWS found no evidence that the goshawk is dependent on large, unbroken tracts of old-growth or mature forest (63 FR 35183 June 29, 1998).

Nest areas are usually mature forest with large trees, relatively closed canopies (50%–90%) and open understories (Squires and Kennedy 2006). In central Idaho, goshawks nest in a variety of forest stands that are comprised of mature trees with relatively high canopy cover and open understories (Moser 2007). Nest trees typically range between 12 and 21 inches dbh and are located on relatively gentle terrain with 70% of nests occurring on shaded aspects. Favored habitats typically are located in forest stands having only 1 or 2 canopy levels with an open or mixed-density understory.

The goshawk is a habitat generalist at the foraging area scale. Goshawk foraging areas are heterogeneous and may include some mature forest components (Squires and Kennedy 2006) as well as a mix of other forest and nonforest components (e.g., sagebrush, grasslands, lowland riparian, and agriculture) (Younk and Bechard 1994, Reynolds 1994, Patla et al. 1997). Goshawks require habitats for prey that contain snags, downed logs, woody debris, large trees, herbaceous and shrubby understories, and a mixture of stand structural stages (Wisdom et al. 2000). They are an opportunistic predator that take prey items on the ground, on vegetation, in the air, and rely on a variety of forested and non-forested habitats.

There are 2,066 acres (5%) of currently suitable nesting habitat in the Analysis Area. Goshawks have been recorded across the Forest and one was observed foraging near the Project boundary during recent field reviews.

Population Trends: The goshawk is rated secure across its range (global rank G5) and is apparently secure (state rank S4) in the state of Idaho (Idaho Digital Atlas 2010). The goshawk population in the northern Idaho portion of the Northern Rockies Bird Conservation Region (BCR) is estimated to be approximately 3,900 birds (Rosenberg 2004). State-wide, the goshawk estimated population is 5,600, with a population objective of 6,200 individuals as noted by Rosenberg (2004). Survey data indicates an overall declining population Idaho since 1966; however it remains relatively stable in the Northern Rockies BCR (Sauer et al. 2011).

No evidence exists that the northern goshawk is declining in number in the western United States (Kennedy 1997, USFWS 1998, Kennedy 2003, Anderson et al. 2005, Squires and Kennedy 2006). Samson (2005) also concluded no scientific evidence exists that the northern goshawk is decreasing in number in the Forest Service Northern Region.

Direct and Indirect Effects

Alternative A—No Action

No management actions would take place. Habitats would continue to be altered by natural events such as succession, insect and disease, and potential wildfire. A wildfire and/or insect and disease activity would likely leave behind greater numbers of snags than exist now but would also reduce canopy cover that may create unsuitable conditions for goshawk nesting.

In general, nesting habitat would increase and foraging habitat would decrease as forest succession continues to fill in understories and increase stand canopy closure. Fuel build-up resulting from fire suppression activities would continue, thereby increasing the likelihood of a stand-replacing fire. Stand-replacing fires would reduce nesting habitat in the short term (<50 years) but would create it and other various elements of goshawk habitat in the long term (>50 years).

Alternatives B, C, and D

All action alternatives would harvest in suitable goshawk nesting habitat. Alternatives B and C would regeneration harvest 93 acres (5%), and Alternative D would harvest 85 acres (4%). Activities would reduce habitat quality by eliminating canopy cover and layering, and reducing some standing snags. Unit prescriptions would retain an average of 14-28 live and/or dead trees per acre. The trees would be of larger dbhs, thereby offering potential perch sites for the goshawk to forage in or along the edges of the temporary clearings. Landscape burning on 45 acres (2%) of nesting habitat would have similar effects except that snags would be retained and additional ones created. Harvest and burning activities would preclude treated areas from being used by nesting goshawks until canopy cover increases to suitable levels (generally >50 years). Implementation of snag and green tree retention guidelines in harvest units, as well as PACFISH buffers, would retain trees for future nesting and help limit effects of habitat simplification.

Commercial thinning would remove suppressed trees leaving 40%–60% of the tree canopy and about 120 tpa. All alternatives would thin 160 acres (8%) of suitable goshawk nesting habitat. Treatments may not retain enough overstory canopy to be used by nesting goshawks, but would promote large tree growth and would provide for foraging opportunities. Thinned areas would become suitable habitat as canopy cover increases over time (>20 years).

During Project implementation, human activity, equipment noise, and burning might preclude use of the area by goshawks. Any active nests found in a treatment unit would be reported to the Zone or Forest a wildlife biologist and activities halted while site specific conservation measures are developed. This would reduce the likelihood of disturbance or injury to individual birds.

None of the Action Alternatives would harvest in the 4,874 acres of MA 20 or the 10,700 acres of RHCAs. This equates to 35% of the analysis area. Mature and old forest habitat would therefore be maintained across the Project area and would be available for goshawk use. The Project is not expected to negatively affect goshawk population trends in the project area or at the Forest level due to the availability of untreated habitat in at both of these scales. Regional estimates indicate sufficient habitat is available to maintain population viability (Samson 2006; Bush and Lundberg 2008).

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area, which includes seven OGAAs. The cumulative effects timeframe is 150 years because it would take this long for regeneration harvest areas to develop old growth habitat characteristics. OGAAs were also selected because goshawks are an old growth MIS.

Alternative A—No Action

The potential cumulative effects of this alternative are the same as those described under the direct and indirect effects of the No Action alternative. There is a potential for cumulative effects; however levels cannot be determined because estimating the size and severity of potential future fires resulting from fire suppression is not possible.

Alternatives B, C, and D

Harvest and burning activities open and remove tree canopy, creating edges and clearings which would increase the amount of grasses, forbs, shrubs, and tree seedlings and improve habitat conditions for some goshawk prey species. Fire suppression would maintain closed canopies in untreated areas potentially improving nesting habitat over time. Suppression also increases the risk of stand replacing fire which could remove nesting habitat. Proposed treatments reduce the crown fire (stand replacement) potential by 7% across the project area.

The OGAAs would retain 6% to 21% verified old growth (see Old Growth section) which would provide nesting habitat for goshawk over time. Additional old growth would be maintained in RHCAs. Negative cumulative effects are not expected due to the availability of untreated habitats and the likelihood that a wildfire would not burn all available nesting habitats during a fire event. There may be slight positive cumulative effects associated with creating openings for prey species. Ongoing and foreseeable actions may disturb goshawks, but would not remove nesting habitat. Forest Plan standards being met by the project for the goshawk include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

Under Alternative B, C, and D, some impacts may occur to individuals or their habitat, but is not expected to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing for the northern goshawk.

3.12.5.4.3 Pileated Woodpecker

The pileated woodpecker was identified as a Forest MIS for old-growth forest and large snag habitat. The pileated is most often associated with mature forests (Samson 2006) although the presence of large trees for nesting is reported to be more important than forest age. Pileated woodpeckers are relatively common in both cut and uncut mid-elevation forests, and appear to do well in a matrix of forest types (Hutto 1995a). They nest in both previously harvested stands that contain remnant large trees and snags, and in mature and old growth forests. The pileated woodpecker is able to do well in young and fragmented forests that retain abundant remnant structure, such as large diameter snags and down woody debris (Mellen et al. 1992).

Pileated woodpecker surveys were conducted in 2012 in the Analysis Area and within a mile outside of its boundary. Eleven pileated detections were made, 8 within the area and 3 in the one mile buffer. Nineteen additional observations were recorded throughout the Analysis Area during project review in 2011 and 2012. Pileated woodpeckers were also detected in 59% of the surrounding surveyed areas of the Middle Fork Clearwater and Selway Rivers. Pileated woodpeckers are common and widespread in the Project area and across the Forest.

Nesting habitat was chosen as the indicator because it is the greatest limiting factor for pileated woodpeckers. Nesting habitat has a narrower range of vegetation conditions when compared to foraging habitat. The Northern Region of the Forest Service summarized available scientific information on the pileated woodpecker (Samson 2006). The report found that the nest tree is the most important variable to estimate breeding habitat use by the pileated woodpecker. Large snags (>20 inches dbh) were preferred over live trees for nesting in the Northern Rocky Mountains, and nesting occurred in, mature cottonwood bottoms, ponderosa pine, and larch stands but also reported use of mixed conifer and cedar-hemlock. The minimum canopy cover selected by pileated woodpeckers for nesting stands ranges from 15% to 60% depending on the habitat type (Bull et al. 1992, Warren 1990, Bull and Holthausen 1993, Bonar 2001).

There are 8,160 acres (19% of the Analysis Area) of currently suitable nesting in the Project area. About 3,000 acres of Douglas-fir habitat was attacked by tussock moth in 2011. Tree mortality is expected to increase in the area in combination with mortality caused by root disease which would provide additional nesting and foraging habitat for woodpeckers.

Population Trends: The pileated woodpecker is rated as secure across its range (global rank G5) and apparently secure (state rank S4) in Idaho (Idaho Digital Atlas 2010).

Breeding Bird Surveys compiled by the U.S. Geological Survey show an increasing population trend for pileated woodpecker over the past 45 years both at the scale of the Northern Rockies and in Idaho (Sauer et al. 2011). The time frame covers almost five decades, including the period when intensive timber harvesting occurred (Bull and Jackson 1995). Samson (2006) concluded that no scientific evidence exists that indicates pileated woodpeckers are declining in the Northern Region.

There is a difference in computer model analysis that is used in determining pileated woodpecker habitat. Samson (2006a) determined that 96,000 acres are needed to maintain minimum viable population for the woodpecker. Bush and Lundberg (2008) used models that would enable them to analyze potential pileated nest habitat in the larger area of Montana and northern Idaho, and calculated that nearly 300,000 acres are on the Nez Perce Forest. The VMAP model used by the district biologist also has limitations: ranges of tree sizes and canopy cover that do not always capture a specific element, such as the 15% canopy cover or greater. The closest available range was 10-25% or greater canopy cover. Therefore, the analysis over-estimated the canopy coverage for potential woodpecker nest habitat.

Direct and Indirect Effects

Alternative A—No Action

The effects of natural disturbance on pileated woodpeckers include events such as insect activity, disease, wind, and fire (Bull et al. 2007). These disturbances are the mechanisms that provide a continuum of snags, downed dead wood, and live trees with decay over time which the woodpecker depends on for nesting, roosting, and foraging. Root disease is prevalent in the Analysis Area and provides a continuous supply of Douglas-fir and grand fir snags which are suitable nesting and foraging trees. Fire suppression would continue. Fuels in the Analysis Area would continue increasing, making the area susceptible to a stand-replacing fire event. A stand replacing event would create snag habitat for pileated woodpeckers. Snag densities are low in the Analysis Area where regeneration harvest has occurred. Habitat quality would improve in these areas as forests mature over time. Overall, suitable habitat would remain available across the area as forest succession continues.

Alternatives B, C, and D

Researchers (Bull et al. 2007) showed a decline in the densities of nesting pileated woodpecker pairs in a project area where regeneration cuts of grand fir converted 50% mature stands to about 3%. In the Clear Creek Integrated Restoration project no verified old growth would be treated. No activities would occur within MA 20 old growth and RHCAs (35% of the analysis area), which would provide suitable and connected nesting habitat across the project area. Additionally, unit prescriptions would retain on average 14 to 28 live and dead trees (9 to 14 snags/acre, depending on habitat type) to meet Forest Plan standards and provide habitat for the woodpecker. Under Alternative B, C, and D, pileated woodpecker populations would be expected to continue to display population stability across the Nez Perce National Forest. Regeneration and improvement harvest occurs on 476 acres (6%) of suitable nesting habitat under Alternatives B and C and 373 acres (5%) under Alternative D. Regeneration harvest would reduce habitat quality, canopy cover, large down wood, and standing snags in treated areas. Implementing snag and green tree retention would help limit these effects. In revisiting their study areas after 30 years, Bull et al. (2007) found that the high tree mortality and loss of canopy closure in stands of grand fir and Douglas-fir did not appear to be detrimental to pileated woodpeckers: provided there was an abundance of large dead or live trees and logs, and that stands were not subject to extensive harvest (i.e., concerted regeneration or fuel reduction harvests). Nesting habitat would be available in these areas once canopy closure reaches preferred levels (about 100 years). Commercial thinning would occur on 399 acres (5%) of suitable nesting habitat and would leave 40%–60% of the tree canopy and about 120 overstory trees per acre. Thinning promotes large tree growth and may retain enough structure and canopy to be used by pileated woodpeckers. Removal of some nesting habitat would occur; however snags tend to be limited in these younger stands. The retention of legacy trees, as well as green trees and snags where possible would provide future nesting habitat through time. No landscape burning or improvement harvest occurs in suitable nesting habitat.

Replanted trees will populate the harvested areas with a new generation of tree species.

Cumulative Effects

The cumulative effect area is the 43,700-acre Project area, which includes seven old growth analysis areas. The cumulative effects timeframe is 150 years because it would take this long for regeneration harvest areas to develop old-growth habitat. Cumulative effects were also assessed using old-growth forest because pileated woodpecker are an old growth MIS.

Alternative A–No Action

The potential cumulative effects of this alternative are the same as those described under the direct and indirect effects of the No Action alternative. The effects of future fires are unknown and immeasurable, as wildfires will create and destroy snags. Woodcutting would continue to occur along roads with open access to public motorized vehicles.

Alternatives B, C, and D

Proposed treatments under all alternatives would slightly reduce potential pileated nesting habitat. Fire suppression would maintain closed canopies in untreated areas potentially improving nesting habitat over time. Suppression also increases the risk of stand replacing fire which could remove nesting habitat. Treatments would reduce the crown fire (stand replacement) potential by 7% across the project area. Snags would continue to be available across the landscape in untreated areas where insect and disease events occur.

The OGAAs contain 6% to 22% verified old growth (see Old Growth section) which would provide nesting habitat for pileated woodpeckers over time. RHCAs cover 24% of the Project area and would be managed for old growth habitat which would also provide habitat for pileated woodpeckers.

No measurable cumulative effects to pileated woodpecker populations at the local or regional scale, or alteration of current population trend, are expected. This is based on increasing populations and the availability of unaffected suitable nesting habitats in the Analysis Area and across the Forest and region. Woodcutting would occur as mentioned in Alternative A. Ongoing and foreseeable projects may disturb woodpeckers, but would not remove their habitat. Forest Plan standards being met by the project for the pileated woodpecker include Standards 1, 7, FW 1, and Page II-6 from Table 3-43.

Under Alternative B, C, and D, *some impacts may occur to individuals or their habitat, but is not expected to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing of the pileated woodpecker.*

3.12.5.4.4 Rocky Mountain Elk

Elk is a MIS for commonly hunted big game species on the Forest. Elk are habitat generalists and use a diversity of forest types and structures that provide forage and hiding cover. They forage in meadows and early seral communities from spring through early summer, use more closed canopies from late summer through fall and rely upon low elevation, warm aspect, and snow-free or snow-limited areas for foraging in the winter. Adult bulls often winter at much higher elevations than cows and immature elk. Elk also require forest cover for security. Preferred calving sites are generally large meadows, shrub fields, and early seral forest openings in close proximity to water.

Population Trends: Elk populations in the Analysis Area were relatively insignificant until a series of major fire events occurred in 1919, 1928, and 1934. These fires increased forage availability and population levels. Elk also benefited from predator control efforts.

The following information was obtained from the Idaho Fish and Game elk management plan (IDFG 2014): The Analysis Area falls in the Idaho Department of Fish and game Elk City Elk Management Zone and is within Management Unit 16. Recent (2008) elk population surveys in the unit showed stable cow and slightly elevated bull elk numbers which are slightly up from the 2000 survey. Cow elk numbers currently meet, and bull numbers exceed State population objectives (Table 3-45). However, calf recruitment decreased from 19 calves per 100 cows (from 1990 to 2000) down to 17 in 2008. The calf:cow ratio is an important indicator of population recruitment and long-term herd viability. A ratio of at least 25 calves to 100 cows is needed to offset natural mortality. Reasons for the decline are unclear but may be related to reductions in forage quality (poor condition of cows and low calf weights), high predation rates, less security area, and greater human disturbance and/or hunting pressure.

Table 3-45. Elk Winter Population Status and Objectives for Management Unit 16 based on the Most Recent Survey (IDFG 2008)

Management Unit	Survey Year	Current Status			Population Objectives		
		Cows	Bulls	Adults	Cows	Bulls	Adults
16	2008	897	275	238	800–1,200	175–250	100–150

Elk Winter Range

The Forest Plan (USDA Forest Service 1987a, p. III-46) designated MA 16 as big game winter range. The goal for MA 16 is to improve the quality of the winter range habitat for deer and elk through timber harvesting, prescribed burning, and other management practices. Winter range is primarily below 4,500 feet in elevation and has southern-to-western exposures. The vegetative types included are non-forest grasslands, seral brushfields, and timbered lands.

High quality forage is an important component of elk winter range. Elk eat grasses, forbs, and the tips of twigs from some woody vegetation. Shrub fields and conifer forests provide a higher proportion of winter forage than grassland sites. Species such as redstem ceanothus, serviceberry, mountain maple, choke and bitter cherry, and syringa provide much of the winter forage available to elk.

The Analysis Area has 15,600 acres of MA 16 winter range (35% of the Analysis Area). Elk also use non-MA 16 areas. Additional winter range is interspersed in the summer range EAAs. A collaborative effort with the Rocky Mountain Elk Foundation to map elk winter range in Idaho identified approximately 28,798 acres of winter habitat in the Analysis Area (66% of area). Fifty-nine percent of it occurs on the western redcedar/grand fir and Douglas-fir/grand fir breakland settings. Winter habitat occurs on 39% of the western redcedar/grand fir upland setting during more mild winter conditions. Most of the MA 16 winter range is closed to motorized use or part of the Clear Creek Roadless Area, providing high levels of secure habitat during the winter months. Most of the wintering elk in Clear Creek are found in Solo Creek and upper Clear Creek where low open road densities provide security areas from winter recreation disturbances.

Direct and Indirect Effects

Alternative A—No Action

There would be no direct effects to elk winter range under Alternative A as no activities would occur. In the absence of natural disturbances winter range forage quality and quantity would decline as tree canopy cover continues to increase and shades out understory forage. Insects and disease impacts may create openings for shrubs, forbs, and grasses, although not to the scale of wildfires. Fire suppression may increase the severity of wildfires due to increased fuel loading. Large wildfires would increase the amount of available winter forage though space and time. Without further disturbance after a fire event, forage quantity would decline and hiding cover would increase in about 20 years.

Regeneration harvest in the project area has affected about 2,400 acres in MA 16, with 842 acres impacted since 1990. Sixty-five percent of these areas are too old (>20 years) to provide high quantity and quality forage. These poor forage areas function as hiding cover for elk. Alternative A does nothing to create early seral habitats that would provide high quantities of forage.

Alternatives B, C, and D

Regeneration and improvement harvest would be conducted on 1,497 acres (10%), 1,925 acres (12%), and 1,104 acres (7%) of MA 16 winter range under Alternatives B, C, and D, respectively. Harvest would reduce elk hiding cover habitat by 10%, 12%, and 7% for the Action Alternatives.

All alternatives use landscape burning on 1,370 acres (9%) of MA 16. Burning in late summer or early fall would increase coverage of shrub species and mimic natural fire seasons. Burning may reduce hiding cover by 9%, but could be less depending on fire severity.

The proposed treatments would reduce tree canopy cover and allow sunlight, water, and nutrients to be more available to shrubs, forbs, and grasses. This would increase forage production on winter range. Forage quality may increase as a result of burning. Post-harvest burning in the fall would stimulate resprouting of important shrubs such as redstem and Scouler willow. These two species are often absent from new openings after harvest and may not re-establish in the absence of fire. Orme and Leege (1976) showed that fall burning produced over three times the seedlings than did spring burning. Higher quality forage would benefit cow elk during winter months. Forage quantity would increase for 20–30 years or until tree canopy cover closes and forage plants begin declining. Alternative C (21%) provides the greatest benefit to elk winter forage, followed by Alternative B (19%) and D (16%).

Commercial thinning would occur on 953 acres (6%), 647 acres (4%), and 775 acres (5%) of the winter range under Alternatives B, C, and D, respectively. Thinning would have short term (<10 years) benefits on elk winter range forage. Thinning retains 40-60% of the canopy cover which limits shrub growth. Hiding cover would be slightly reduced under all alternatives.

Precommercial thinning is proposed for 560 acres (4%) of winter range and is anticipated to have minimal effects on elk winter forage, as much of the canopy cover would be retained and limit shrub growth.

Cumulative Effects

The cumulative effects analysis is the 43,700 acre Project area. The timeframe is 20 years: the time when tree canopy cover would begin to close and reduce the quality of elk winter forage.

Alternative A—No Action

The cumulative effects for this alternative are the same as described under the direct and indirect effects of the alternative. There would be a continued decline in elk winter forage quantity and quality if no wildfires occur. Forage could increase in the event of a wildfire however it is not possible to predict the amount or location.

Alternatives B, C, and D

The Action Alternatives would conduct regeneration or improvement harvest and landscape burning on up to 30% of MA 16 winter range. These treatments would create early seral habitats that provide high quantities of quality forage for about 20 years. Such treatments would meet the management intent to increase or improve big game winter range. The action alternatives would meet Forest Plan standards for MA 16 by implementation of seasonal road closures as per the motorized travel guide, and restricting public access to temporary roads or other roads utilized by harvest activities.

Insects and disease would continue to create openings for the limited growth of shrubs, forbs, and grasses. Fire suppression would continue and fuels would continue to increase in untreated areas. A large fire could significantly increase the amount of winter forage and would decrease hiding cover for elk; however predicting the time and size is not possible. Habitats would be less susceptible to wildfire because proposed treatments reduce crown fire potential on 7% of the Analysis area.

Elk Summer Range

The majority of the Analysis Area is considered summer range for elk. Important habitat components for elk include foraging sites, hiding cover, calving areas, rutting, and security areas. Forage availability and abundance has declined throughout the area due to a lack of disturbance (fire, timber harvest) and subsequent increases in tree copy cover. Hiding cover is available in forested stands that are 20 years or older. Elk Security areas are places where wildlife can retreat for safety when affected by disturbance. In general, security areas are over 250 acres in size and >0.5 miles from an open road or trail. There are no forest plan standards for the amount of security areas to be managed.

"Guidelines for Evaluating and Managing Summer Elk Habitat in Northern Idaho" (Leege 1984) was used to evaluate summer elk range and considers road open road density, livestock grazing, cover-forage ratios, and security areas.

An updated reference on elk summer habitat management (Servheen et al. 1997) has generated interest from some of the public as to replace the Leege (1984) guidelines. Servheen et al. (1997) suggest analyzing for motorized trails, which were not considered at the time the forest adopted the 1984 guidelines. However, the calculations for primitive roads (found in the Leege 1984 worksheets) use the same co-efficients as the temporary road and system trail (found in Servheen et al. 1997 worksheets). Thereby, a motorized trail is now analyzed under the primitive road section of the worksheet, which results in the same value of standard road miles by either guideline. Overall the Servheen et al. (1997) model uses the same mileage co-efficients for road and motorized trail conditions (open, closed, or seasonal closures) as the Leege et al. 1984. Road and trail densities are the same between both models. Livestock presence in an elk analysis area is similarly calculated, as well as security areas, cover and forage. Displays of the calculation sheets for both models is located in the Wildlife Appendix F.

The Elk Vulnerability model is unique to the Servheen et al. analysis. The model attempts to analyze elk depredation from hunting, natural mortality factors, road impacts (access for hunters), and extrapolate this information to trends in elk mortality per Game Management Unit (GMU).

Liabilities of the model for use with Forest Service projects include the scale of analysis and mortality factors. The desired scale for analysis is at the Game Management Unit (GMU). These units range in size from 262 mi² to 1,555 mi²; while the Clear Creek Project area is 68.3 mi². For impacts on elk in the project area, the biologist analyzes smaller polygons called Elk Analysis Areas or EAAs. These units are calculated from the input proposed in guidelines from Leege et al. (1984), which is also used in Servheen et al. (1997). Each EAA in the project area ranges from 7 to 14 mi². Extrapolating road densities from Forest service lands, such as the Clear Creek Project, to a GMU is conjecture, and not a dependable source for determining elk vulnerability at the larger scale. Road densities and hunter activities vary on private and corporate lands, in comparison to Forest Service lands. The larger size of the GMUs in Central Idaho include wilderness, roadless areas and other terrain inaccessible to motorized vehicles, as well as the areas previously stated.

Mortality factors in the Vulnerability Model depend on consistencies. Changes in hunting seasons or alteration of gender numbers allowed for hunting would skew trends the Servheen document discusses. The elk vulnerability model only gathers data on legal hunting. Illegal take is not factored. Treaty rights for the Nez Perce tribe allows take of big game throughout the year, of either sex, with any weapon. The model does not address this supplemental mortality. Additionally, the IDFG has recently increased trapping and other controls on the wolf population; which was not a consideration in the Servheen et al. 1997 guidelines. The latter document discusses a 10% natural mortality for elk, but the state's increased predator control must be the result of a known or perceived natural threat that is creating a larger mortality of elk than originally thought.

The IDFG has not contacted the forest about the need or implementation of this model. The public arguing for the change of elk modeling guidelines are requesting the agency replace a 30-year old plan with one that is nearly 20 years old. Both need to be replaced with an analysis that uses the best available science, and more up to date knowledge. As the Forest progresses in its forest plan revision, the best available science will be selected and used for elk analysis. The Forest Service manages habitat for wildlife, while the IDFG manages the state populations for animals that are legally hunted or trapped. It would make more sense for the IDFG to generate and interpret this model, as they gather annual hunter harvest information to determine the management (tags, timing of season, etc.) for elk in each Big Game Unit.

The Forest Plan objective for summer range elk habitat effectiveness (EHE) is to achieve a minimum of 50% effectiveness in each EAA. There are seven EAAs, and all areas would meet the objective of ≥50% EHE upon completion of the project (Table 3-46).

Errors were detected in the analysis of the guidelines conducted for the Draft EIS. Livestock presence was absent or incorrectly analyzed, as were road densities and security areas. The Leege et al. 1984 guidelines were recalculated and reviewed for accuracy for this Final EIS.

Table 3-46. Elk Summer Range Habitat Effectiveness by Alternative in the Clear Creek Analysis Area. The Forest Plan Objective is 50% for each Elk Analysis Area (EAA).

Elk Analysis Area		Summer Elk Habitat Effectiveness (%)			
Name	Number	Existing Condition	Alternative B	Alternative C	Alternative D
Clear Creek 1	304064022	56	56	56	56
Clear Creek 2	304064021	69	69	70	69
Clear Creek 3	304064031	55	56	58	56
Brown Springs	304067152	49	50	50	50
Pine Knob	304067151	51	52	52	52
Solo Creek	304067171	51	51	52	52
S. Fork Clear Creek	304064011	80	82	83	82

Direct and Indirect Effects

Alternative A—No Action

There would be no direct effects to summer EHE under Alternative A because no activities would occur. Summer range would be more susceptible to wildfire when compared to the Action Alternatives due to increasing fuel loads resulting from fire suppression. A large wildfire would reduce hiding cover in the short-term (10–20 years) but would increase forage. All EAAs would continue to meet the Forest Plan objective of 50% (Table 3-46).

Alternatives B, C, and D

Regeneration, improvement harvest, and prescribed fire would remove hiding cover and increase summer forage in the Project area. Alternative B treats 4, 311 acres (10%), Alternative C treats 5,858 acres (13%), and Alternative C treats 3,760 acres (9%) of the Project area. Forage quantity would increase for 20–30 years and then decline as tree canopy cover closes. Improvements in the quantity and quality of forage would benefit the condition of cow elk going into winter and ultimately improve calf survival.

New openings created by the alternatives from regeneration and improvement harvests would reduce security areas. When closed roads are opened for harvest, thinning or burning, the half mile buffer to each road temporarily suspends elk security areas near the road, until vegetation matures to the point of providing cover: about 10-20 years after treatment and tree planting.

Reductions in elk habitat effectiveness below 50% would occur in all but one EAA during implementation of the action alternatives. This would result from roads that are opened for access to project activities, and would create a temporary loss or reduction of elk security.

None of the alternatives would construct permanent roads or change access restrictions on existing roads or trails. Roads proposed for decommissioning are currently closed or are impassable to motorized vehicles due to fallen trees or thick vegetation. Decommissioning would have minimal effects on current elk security. It would permanently prevent any future motorized access, which would maintain elk security areas indefinitely. Indirectly, regeneration harvest in security areas would create openings and potentially increase vulnerability to hunters. The risk is considered low, as the roads to the treated units would be closed to motorized access. Regeneration harvest effects on security would last 10-20 years until hiding cover is re-established in these areas.

The EHE analysis is run as if all roads are open and all proposed units are being treated simultaneously. This exercise overestimates the impacts of project activities to elk. In reality, the harvest contractor would work a cluster of units within close proximity of one another. This reduces transportation costs and focuses the work to complete each unit before moving to the next. During treatment activities, roads used for access to units would remain closed to public motorized access. Upon completion of treatments in the units, all temporary roads would be decommissioned and Forest Service system roads would revert to their present travel management restrictions (in most cases, closed to public motorized access by a barrier). So activities in the affected EAAs would occur as pulses of disturbance over time, leaving available areas for elk security that are not affected.

Reductions occur because some created openings are greater than 800 feet from hiding cover. Elk use in forage areas is reduced when distances to hiding cover exceeds 800 feet (Leege 1984). Although the proposed treatments would reduce EHE during project implementation, all EAAs would return to the existing condition or an improved level upon completion of proposed activities. All EAAS would meet the Forest Plan objective of 50% (Table 3-47). Elk populations are expected to respond favorably to proposed treatments due to increased foraging opportunities.

Additionally, the calculations for livestock presence give the reader the impression that cattle are present throughout the project area. In fact the cattle move as a group along very few road systems in the area. They graze along flats and spurs adjacent to the roads, such as Road #286. They are unlikely to graze on steep slopes; leaving their activities and impacts confined to a very small part of the project area.

Commercial and precommercial thinning has no effect on the calculations for elk habitat effectiveness (Leege 1984).

Direct and indirect effects would be disturbance to elk from activities conducted by machines and presence of man. Elk may be temporarily avoid areas with the above activities during daylight hours. However, during hours of darkness, elk may move into these areas to forage on the downed vegetation. Upon completion of the project, openings created by treatments would begin producing forage in 3 to 5 years, and be available for about 15-20 years.

Cumulative Effects

The geographic boundary for assessing cumulative effects on elk summer habitat effectiveness is the combined seven EAAs within the 43,700 acre Project area. The time frame for cumulative effects is 20 years, which is the time it takes for new plantations to restore elk hiding cover in the harvested areas.

3.12.5.4.5 Alternative A- No Action

There would be no direct or indirect, and therefore no cumulative effects to modeled EHE since fire suppression is not considered in the model. Firewood cutting would continue to occur along roads that are open to public motorized access. Elk would probably avoid these areas until the activities are finished and the humans have departed.

3.12.5.4.6 Alternatives B, C, and D- Action Alternatives

As mentioned, direct effects would be a reduction in hiding cover (3% to 20% depending on the alternative) across most of the EAAs. This reduction would be an increase in forage for the same percentage range. Indirect effects would be improved forage habitat for elk up to approximately 20 years. Elk security areas would be reduced from roads used and openings created during implementation of the action alternatives. Upon completion, the roads would be decommissioned and closed to public motorized access, increasing elk security to levels near the existing or pre-project conditions. Hiding cover would recover in 10-15 years.

Past road decommissioning from the South Fork/West Fork EA was already considered in the existing condition. The Clear Ridge Road Decommissioning project (2015) would improve elk security areas. The proposed Johnson Bar Salvage Sale (2016) would create additional foraging opportunities for elk. The ongoing DRAMVU project would eliminate cross-country motor vehicle use on the forest.

Besides the conclusion for the preceding effects, no other cumulative effects are anticipated except for wildfires or fire suppression. Wildfires may create more forage for summer range. Effects are unknown, as timing and size of such events are unpredictable. Fire suppression would strive to contain fires in the affected area(s). Firewood cutting would occur as mentioned under Alternative A. All proposed project activities would maintain EHE above Forest Plan minimum levels.

Other literature on elk modelling has suggested models on road effects (Rowland et al. 2000 & 2005), size of elk unit to be analyzed (Rowland et al. 2005, Unsworth et al. 1998, Boyce et al. 2003) and other elk habitat considerations. The forest is undergoing a new Forest Plan revision, and the above literature as well as future work will be considered in the development of a structure for analyzing elk on the combined Nez Perce/ Clearwater National Forest.

In summary, the action alternatives are meeting the Forest Plan standards for MA 16 winter range, and at least 50% EHE. There are no Forest Plan standards for elk security. Ongoing and foreseeable actions would disturb elk in or adjacent to such activities; however, habitat would not be lost, with the exception of the private land harvest. It is unknown what habitat would remain. The conclusion of the road decommissioning project would provide more elk security after the vegetation matures to a level of density that offers elk cover. Overall, the Forest Plans standards that this project meets Standards 1,5, 6, 10, Pages II-5 and 6 from the 1987 Forest Plan (see Table 3-43 in wildlife section).

3.12.5.4.7 Shiras Moose

Moose are a Forest MIS representing hunted big game species and old-growth/Pacific yew habitats. Moose in north-central Idaho select dense Pacific yew stands in old-growth grand fir communities during winter (Pierce and Peek 1984). Suitable habitats are characterized by an overstory of old growth grand fir and an understory of Pacific yew (a primary winter forage species for moose). An increase in the frequency and extent of yew has likely resulted from fire suppression; however timber harvest has likely reduced it in these same areas. Pacific yew was typically slashed and burned during regeneration timber harvest practices prior to 1987 (Crawford 1983 and Stickney 1981). From 1987 to 1991, harvest and burning were constrained in areas allocated to moose winter range. Since 1992, timber harvest and burning in Pacific yew stands have been reduced considerably based on the Conservation Guidelines for Pacific Yew (USDA 1992). Past harvest has reduced patch size and interior conditions, and isolated Pacific yew stands.

The Forest Plan designated MA 21 as grand fir/Pacific yew communities to be managed for moose winter range. The goal in MA 21 is to provide for the continuing presence of

Pacific yew suitable for moose winter habitat. The Forest Plan contains Management standards and practices for timber harvest and fire management can be found in the Forest Plan (USDA Forest Service 1987a, p. III-59).

There are 3,686 acres (8%) of MA 21 in the Analysis Area, all located in the southern third of the area. There are 2,700 acres (77%) of currently suitable moose winter range habitat in MA 21. The other 23% is not suitable due to past harvest in or prior to the 1980s. Harvests created patchy areas of suitable habitat. There are 8 patches ranging in size from 8 to 2,658 acres (mean = 599). The two largest patches are over 1,400 acres. Past timber harvest and postharvest site preparation (hand, mechanical, and burning) reduced the winter habitat suitability for moose through the removal of the conifer overstory and the Pacific yew understory.

The Forest Plan limits the amount of MA 21 regeneration harvest to 5% per decade and prescribes the retention of 50% of the live yew component scattered throughout the harvest unit in one-quarter to one-half acre patches. The preferred harvest type is patch clearcuts (preferably 5-10 acres and no more than 20 acres), individual tree selection, group selection or shelterwood. Leave strips between yew stands should also be retained to provide travel corridors for moose.

Additional moose winter range totaling 8,156 acres lies outside of MA 21 in areas of subalpine fir (VRUs 1 and 10) and in smaller patches of grand fir/ yew in the headwater of the Project area (VRU 7). These are included in the effects analysis below but do not require the same Forest Plan guidelines as MA 21. Desired conditions for these areas are to retain a variety of conifer species including grand fir, Engelmann spruce, subalpine fir, western red cedar, Douglas-fir, western larch, lodgepole pine, and Pacific yew. These areas help to support moose populations in the project area. Suitable and potential summer range for moose is available throughout the mid- and upper elevations of the Analysis Area.

Peek et al. (1987) recommended no more than about 45% of MA 21 should be in an age class younger than 90 years, and no more than 14% should be logged in any 30-year period. Roughly 835 acres (23%) of MA 21 is currently younger than 90 years old and 388 acres (11%) was harvested between 1982 and 2012. The area currently meets these recommendations.

Population Trends: The Analysis Area is in IDFG Management Unit 16. Moose are managed where populations are large enough to support controlled hunts. Management Unit 16 currently has 4 antlered moose harvest permits which is down from 14 to 17 permits issued since 2000. Population levels of moose have fluctuated noticeably over time. Several sets of moose tracks were observed both within MA 21 and outside of it during field surveys.

Direct and Indirect Effects

Alternative A—No Action

There would be no direct or indirect effects under this alternative since no activities would occur. MA 21 habitats would continue to provide moose winter habitat. Old grand fir trees would die of insects and disease, creating canopy gaps where small patches of regenerating trees would develop. This process would perpetuate the multistory conditions characteristic of grand fir/Pacific yew winter range. Outside of MA 21, in VRUs 1, 7, and 10, this process would also occur.

Alternatives B, C, and D

Regeneration harvest would occur on 130 acres (3%), 161 acres (4%), and 49 acres (1%) of MA 21 for Alternatives B, C, and D, respectively. This harvest type would reduce mature grand fir levels within treatment units, limiting the development of future old growth grand fir. Design features would limit patch size and retain overstory trees and existing Pacific yew in order to maintain a presence and perpetuate moose winter range. Regeneration harvest in MA 21 may slightly fragment moose winter habitat, but silvicultural prescriptions consistent with the Forest Plan would be applied to minimize effects. All grand fir and Pacific yew would be retained within PACFISH buffers which would provide a future seed source for grand fir and yew and also provide travel corridors for moose. None of the Action Alternatives would exceed the 5% per decade harvest requirement for MA 21.

Regeneration harvest would occur on 329 acres and 345 acres (4%) under Alternatives B and C, and 255 acres (3%) for Alternative D, outside of MA 21 on moose winter range. Mature grand fir trees would be removed within treatment units, limiting the development of old growth grand fir. All trees, including grand fir and yew (in VRU 7) would be retained within PACFISH buffers which would provide a future seed source for grand fir and also provide moose travel corridors. Moose summer and winter habitat would continue to be available.

Precommercial thinning would occur on 283 acres (8%) of MA 21 under all alternatives. Commercial thinning would occur on 363 acres (10%), 332 acres (9%), and 298 acres (8%) of MA 21 under Alternative B, C, and D respectively.

Precommercial thinning would occur on 248 acres (3%) outside of MA 21 on moose winter range. Commercial thinning activities would occur outside of MA 21 on moose winter range on 625 acres (8%) for Alternative B and 581 acres and 607 acres (7%) for Alternatives C and D. Thinning would not affect suitable moose winter habitat as little to no Pacific yew remains in the stands due to past harvest and site preparation. Thinning would favor early seral species and Douglas-fir limiting the availability of grand-fir in the future. Some grand fir is present and would be retained in the stands due to tree spacing requirements and natural regeneration as stands age. Grand fir would also be retained in PACFISH buffers which would provide a future seed source for the species and suitable habitat for moose.

The Alternatives B and D would meet both recommendations as described by Peek et al. (1987). Alternative C would exceed the suggested regeneration harvest limit by 1% over a 30-year period. All action alternatives would increase the harvested areas to no more than 27% of an age class of under 90 years. Thus, each alternative would remain below the 45% disturbance recommended by the authors.

Cumulative Effects

The cumulative effects area is the 43,700 acre project area. This area contains all MA 21, all grand fir/yew habitats, and provides general moose habitat. The time frame for cumulative effects is 30 years as that is the time it takes for a closed canopy to develop over understory yew trees in harvest units with Forest Plan MA 21 retention requirements.

Alternative A- No Action

There could be minor cumulative effects under this alternative from fire suppression which would increase the risk of stand replacing fire in the Project Area. This type of fire could kill existing yew and create large canopy openings where yew would have low survival. Predicting the size and severity of wildfire is not possible so the level of potential cumulative effects cannot be determined.

Alternatives B, C, and D

The Action Alternatives would reduce grand fir habitat slightly (<4%) but would be within Forest Plan guidelines for MA 21. Project activities would reduce the risk of stand replacing fire on 7% of the Project area which would reduce the potential impacts to MA 21 and other moose habitat. Fire suppression would continue but the risk of fire would be lessened under these alternatives when compared to the No Action Alternative. Predicting the size and severity of wildfire is not possible so the level of potential cumulative effects cannot be determined. The culvert replacement and road decommissioning projects would disturb individual moose in or near the area of activities. As the vegetation recovers in these areas, more forage would become available to moose. It is unknown if the private harvest will retain any habitat for moose. Forest Plan standards being met by the project for the moose include Standards 1, 7, FW 1, and Page II-6 from table 3-43.

3.12.5.4.8 Neotropical Migrants

Under the National Forest Management Act (NFMA), the Forest Service is directed to "provide for diversity of plant and animal communities based on the suitability and capability of the specific land area in order to meet overall multiple-use objectives" (P.L. 94-588, Sec 6 (g) (3) (B)). The January 2000 USDA Forest Service (FS) Landbird Conservation Strategic Plan, followed by the US Shorebird Conservation Plan and Executive Order 13186 in 2001, and the January 2004 PIF North American Landbird Conservation Plan all reference goals and objectives for integrating bird conservation into forest management and planning.

In late 2008, a *Memorandum of Understanding between the USDA Forest Service and the US Fish and Wildlife Service to Promote the Conservation of Migratory Birds* was signed. The intent of the MOU is to strengthen migratory bird conservation through enhanced collaboration and cooperation between the Forest Service and the USFWS as well as other federal, State, tribal, and local governments. Within the National Forests, conservation of migratory birds focuses on providing a diversity of habitat conditions at multiple spatial scales and ensuring that bird conservation is addressed when planning for land management activities.

The Nez Perce National Forest Plan contains language, “Provide and maintain a diversity and quality of habitat to support viable populations of native and desirable non-native wildlife species” (USDA Forest Service 1987a); which accommodates this more recent MOU. Opportunities to promote conservation of migratory birds and their habitats in the project area exist on forest with riparian buffers, limited activities in old growth, inventoried roadless areas, wilderness areas, wild and scenic designated areas, regional snag guidelines, and the flexibility of the Forest Plan to accommodate amendments. Examples of the latter are incorporating wildlife changes in management for threatened and endangered species and sensitive species.

Design criteria for project activities cover potential disturbances to birds, and allow for mitigations of the project if necessary. Timber harvest techniques and prescribed burning would benefit many species of neotropical migrants that depend on shrubs and seral tree species for nesting and foraging.

Direct and Indirect Effects

No Action Alternative

There would be no direct or indirect effects to neotropical migrants since no activities or disturbance would occur.

Alternatives B, C, and D

Noise and movement of machinery and other human activity may disturb migrant birds. The operating season may disrupt some nesting birds in or near areas of project activities. Harvest operations would begin in July, when some bird species may have fledglings present near their nest. However, most of the timber harvest and prescribed burning would occur after young birds have left the nest. Additionally, most of the project activities would not occur in riparian habitats.

Design criteria would have the biologist involved with any detection of birds or nests by the project inspector. If the latter occurs, mitigations would be implemented to reduce impacts to birds or any animal that may be affected by the project activities.

Cumulative Effects

No Action Alternative

There would be no direct or indirect effects to neotropical migrants from this alternative; therefore, there are no cumulative effects. Current population trends would be unaffected.

Alternatives B, C, and D

The short-term effects have been listed above in the direct and indirect effects. Long-term effects would be the benefit of increased vegetation for forest preferring migratory birds. The reduction of road densities would also discourage predation or parasitism of neotropical migrants from species that prefer edge effect habitats: cowbirds, starlings, ravens, and others. Ongoing and foreseeable projects would disturb of displace some species of migrant birds. Besides the private harvest, the other projects would produce vegetation that would be available for migrant birds as the plant structure reaches the life stage that is preferred for the various species of birds. Forest Plan standards being met by the project for the migratory birds include Standards 1, 7, FW 1, and Page II-6 from Table 3-43. The determination for the action alternatives -*some impacts may occur to individuals or their habitat, but is not expected to result in a loss of viability in the Planning Area, nor cause a trend toward federal listing.*

Chapter 4–Consultation and Coordination

The Forest Service consulted the following individuals, federal, State, and local agencies, tribes, and non-Forest Service persons during the development of this Final Environmental Impact Statement:

4.1.1.1 Interdisciplinary Team Members

Matt Bienkowski—Silviculture

Wes Case—Silviculture

Missy Dressen—Wildlife

Glen Gill—Wildlife

Doug Graves—Fire/Fuels/Air Quality/Roadless

Clay Hayes—Idaho Department of Fish and Game

Lois Hill—Team Leader

Joe Hudson—District Ranger

Diana Jones—Visual Resources

Margaret Kirkeminde—GIS/Maps

Lynelle Knehans—Roads

Megan Lucas—Watershed/Soils

Steve Lucas—Heritage Resources

Michelle Roberts—Wildlife

Cindy Schacher—Heritage Resources

Karen Smith—Fisheries/Aquatics

Michael Ward—CFLRA Coordinator

John Warofka—Botany

Tam White—Logging Systems/Economics/Layout

4.1.1.2 Federal, State, and Local Agencies

City of Cottonwood, Idaho

Idaho County Sheriff

Idaho Department of Environmental Quality

Idaho Department of Fish and Game

Idaho Department of Lands

Idaho State Historic Preservation Office

Kamiah Chamber of Commerce, Kamiah, Idaho

National Marine Fisheries Service

National Oceanic and Atmospheric Administration

National Resource Conservation Service

U.S. Fish and Wildlife Service

4.1.1.3 Tribes

Nez Perce Tribe

4.1.1.4 Others

Alliance for the Wild Rockies

The Clearwater Basin Collaborative

The Friends of the Clearwater

The Nature Conservancy

Chapter 5–Glossary and Acronyms

A

Activity	A measure, course of action, or treatment that is undertaken to directly or indirectly produce, enhance, or maintain forest and range land outputs or achieve administrative or environmental quality objectives.
Affected Environment	The biological and physical environment that will or may be changed by actions proposed and the relationship of people to that environment.
AIRFA	American Indian Religious Freedom Act of 1978.
Alternative	One of several policies, plans, or projects proposed for decisionmaking.
Anadromous Fish	Fish which spend much of their adult life in the ocean, returning to inland waters to spawn; e.g., salmon, steelhead.
Aquatic Ecosystem	A stream channel, lake, or estuary bed, the water itself, and the biotic communities that occur therein.
ATV	All-Terrain Vehicle. A type of off-highway vehicle that travels on three or more low-pressure tires; has handle-bar steering; is less than or equal to 50 inches in width; and has a seat designed to be straddled by the operator.

B

Best Management Practices, BMP, BMPs	The set of standards in the Forest Plan which, when applied during implementation of a project, ensures that water related beneficial uses are protected and that State water quality standards are met. BMPs can take several forms. Some are defined by State regulation or memoranda of understanding between the Forest Service and the States. Others are defined by the Forest interdisciplinary planning team for application Forestwide. Both of these kinds of BMPs are included in the Forest Plan as forestwide standards. A third kind is identified by the interdisciplinary team for application to specific management areas. A fourth kind, project level BMPs, is based on site specific evaluation, and represents the most effective and practicable means of accomplishing the water quality and other goals of the specific evaluation, and represents the most effective and practicable means of accomplishing the water quality and other goals of the specific area involved in the project. These project level BMPs can either supplement or replace the Forest Plan standards for specific projects.
Big Game	Those species of large mammals normally managed as a sport hunting resource.
Big Game Summer Range	Land used by big game during the summer months.
Big Game Winter Range	The area available to and used by big game through the winter season.
Biological Evaluation	An assessment required by the Endangered Species Act of 1973 to identify any threatened, endangered, or sensitive species which is likely to be affected by a proposed management action, and to evaluate the potential effects of the proposed action on the species or their habitats.
Biological Potential	The maximum possible output of a given resource, limited only by its inherent physical and biological characteristics.
BLM	Bureau of Land Management
BO	Biological Opinion

Browse	Twigs, leaves, and young shoots of trees and shrubs on which animals feed; in particular, those shrubs which are utilized by big game animals for food.

C

Capability	The potential of an area of land and/or water to produce resources, supply goods and services, and allow resource uses under a specified set of management practices and at a given level of management intensity. Capability depends upon current conditions and site conditions such as climate, slope, landform, practices such as silviculture, or protection from fires, insects, and disease.
Cavity	A hollow in a tree which is used by birds or mammals for roosting and reproduction.
CBC	Clearwater Basin Collaborative
CEQ	Council on Environmental Quality
CFLRP	Collaborative Forest Landscape Restoration Program
CFR	Code of Federal Regulations
Channel Morphology	The study of the channel pattern and the channel geometry at several points along a river channel, including the network of tributaries within the drainage basin. Also known as fluviomorphology; stream morphology.
Channel Type	A system developed by hydrologist Dave Rosgen To classify and characterize similar stream channels. Water surface gradient and substrate particle size are the primary stream features used. Other features include bankfull width, width to depth ratio, entrenchment ratio, and floodprone width.
Closed Roads	Roads developed and operated for limited use. Public vehicular traffic is restricted except when they are operating under a permit or contract or in an emergency.
Closure	The administrative order that does not allow specified uses in designated areas or on Forest development roads or trails.

Commodities	Resources with commercial value; all resource products which are articles of commerce, such as timber, range, forage, and minerals.
Council on Environmental Quality, CEQ	An advisory council to the President established by the National Environmental Policy Act of 1969. It reviews Federal programs for their effect on the environment, conducts environmental studies, and advises the President on environmental matters.
Cover	Vegetation used by wildlife for protection from predators, or to protect themselves from weather conditions, or in which to reproduce.
CRB	Columbia River Basin
Critical Habitat	Specific areas within the geographic area occupied by a species on which are found those physical and biological features (1) essential to the conservation of the species and (2) which may require special management considerations or protection. Critical habitat does not include the entire geographic area which may be occupied by a Threatened or Endangered species.
Cultural Resources	The physical remains of human activities, such as artifacts, ruins, burial mounds, petroglyphs, etc., and the conceptual content or context, such as a setting for legendary, historic, or prehistoric events as a sacred area of native peoples, etc., of an area.
Cumulative Effect	The impact on the environment which results from the incremental impact of the action when added to other actions. Cumulative impacts can also result from individually minor but collectively significant actions taking place over a period of time.
CWA	Clean Water Act
CWMA	Cooperative Weed Management Areas

D

DEIS	Draft Environmental Impact Statement
DEQ	Department of Environmental Quality
Desired Future Condition; DFC	Desired Future Condition; a desired condition of the land to be achieved sometime in the future.

Detrimental Soil Disturbance	Compaction, displacement, erosion, loss of organic matter, and decreased soil productivity
Developed Recreation	Recreation that occurs where improvements enhance recreation opportunities and accommodate intensive recreation activities in a defined area.
Direct Effects	Effects on the environment which occur at the same time and place as the initial cause or action.
Dispersed Recreation	That portion of outdoor recreation use which occurs outside of developed sites in the unroaded and roaded Forest environment; i.e., hunting, backpacking, and berry picking.
Disturbance	Any management activity that has the potential to accelerate erosion or mass movement; also any other activity that may tend to disrupt the normal movement or habits of a particular wildlife species. At the landscape scale, a disturbance would be a force, such as wildfire, disease, or large scale vegetation management, which can significantly alter existing ecosystem conditions.
Diversity	The distribution and abundance of different plant and animal communities and species within an area.
Draft Environmental Impact Statement; Draft EIS; DEIS	Draft Environmental Impact Statement. A detailed written statement as required by Section 102(2)(C) of the National Environmental Policy Act.
DRAMVU	Designated Routes and Areas for Motor Vehicle Use
DSD	Detrimental Soil Disturbance

E

EAU	Elk Analysis Unit
Economic Efficiency	The usefulness of inputs (costs) to produce outputs (benefits) and effects when all costs and benefits that can be identified and valued are included in the computations. Economic efficiency is usually measured using present net value, though use of benefit cost ratios and rates of return may sometimes be appropriate.
Ecosystem	A complete, interacting system of organisms considered together with their environment; a marsh, watershed, or lake, for example.

Effects (or Impacts)	Physical, biological, social, and economic results (expected or experienced) resulting from natural events or management activities. Effects can be direct, indirect, and/or cumulative.
EHE	Elk Habitat Effectiveness
Endemic	Term applied to populations of potentially injurious plants, animals, or viruses that are at their normal, balanced, level, in an ecosystem in contrast to epidemic levels. Plant and animal diseases which are prevalent in or peculiar to a certain locality.
Elk Hiding Cover	Vegetation, primarily trees, capable of hiding 90% of an elk seen from a distance of 200 feet or less.
Elk Security Area	An area elk retreat to for safety when disturbance in their usual range is intensified, such as by logging activities or during the hunting season. To qualify as a security area, there must be at least 250 contiguous acres that are more than 1/2 mile from open roads.
Endangered Species	Any species which is in danger of extinction throughout all or a significant portion of its range, and listed as such by the Secretary of the Interior in accordance with the Endangered Species Act of 1973.
Energy Limited Streams	An energy limited stream is generally a low energy, meandering type system with a large source of sediment in the bed and banks. They tend to be more sensitive than supply limited systems to excess sediment deposition. They recovery slowly if at all from sediment depositing events.
Environment	The aggregate of physical, biological, economic, and social factors affecting organisms in an area.
Environmental Analysis	An analysis of alternative actions and their predictable short and long term environmental effects which include physical, biological, economic, social, and environmental design factors and their interactions.

Environmental Assessment; EA	A concise public document for which a Federal agency is responsible that serves to: (1) briefly provide sufficient evidence and analysis for determining whether to prepare an Environmental Impact Statement or a Finding of No Significant Impact; (2) aid an agency's compliance with the National Environmental policy Act when no Environmental Impact Statement is necessary; and 93) facilitate preparation of an environmental impact statement when one is necessary.
Environmental Impact Statement; EIS	A concise public document for which a Federal agency is responsible that serves to (1) briefly provide sufficient evidence and analysis for determining whether to prepare an environmental impact statement or a finding of no significant impact; (2) aid an agency's compliance with the National Environmental Policy Act when no environmental impact statement is necessary; and (3) facilitate preparation of an environmental impact statement when one is necessary. Also see DEIS, FEIS.
EO	Executive Order
Ephemeral	A depression in the topography that carries surface water during peak rainfall events.
Epidemic	Plant and animal diseases which rapidly build up to highly abnormal and generally injurious levels.
Erosion	The wearing away of the lands's surface by water, wind, ice, or other physical processes. It includes detachment, transport, and deposition of soil or rock fragments.
ESA	Endangered Species Act
Essential Habitat	Areas with essentially the same characteristics as critical habitat but not declared as such. These habitats are necessary to meet recovery objectives for endangered, threatened, and proposed species.

F

Final Environmental Impact Statement; Final EIS; FEIS	Final Environmental Impact Statement. The final version of the public document required by the National Environmental Policy Act (see Draft Environmental Impact Statement).

Floodplain	Low land and relatively flat areas joining streams, rivers, and lakes which are periodically inundated by overbank flows of water.
Focus Areas	Large polygons within the project area that provide opportunities to create larger patches of similar vegetation by connecting recently regenerated stands, or retaining existing areas of unfragmented forest.
Forage	All browse and nonwoody plants available to livestock or wildlife for feed.
Forest Plan	Nez Perce National Forest Land and Resource Management Plan, September, 1987.
Forest and Rangeland Renewable Resources Planning Act of 1974	An act of Congress which requires the assessment of the nation's renewable resources and the periodic development of a national renewable resources program. It also requires the development, maintenance and, as appropriate, revision of land and resource management plans for National Forests.
Forest Type	A classification of forest land based on the live tree species present.
FP	Forest Plan
FR	Federal Register
FS	Forest Service
FSH	Forest Service Handbook
FSM	Forest Service Manual
Fuels	Includes both living plants and dead, woody vegetation that are capable of burning.
Fuels Management	Manipulation or reduction of fuels to meet Forest protection and management objectives while preserving and enhancing environmental quality.
USFWS	Fish and Wildlife Service

G

Geographic Information System; GIS	Geographic Information System. A computer program for manipulating landscape configuration data.
Geomorphic Threshold	The percent increase of sediment over normal or natural conditions which may result in unstable channel conditions in a stream system.

H

Habitat	A place where a plant or animal naturally or normally lives and grows.
Habitat Effectiveness	The measure of how open roads affect utilization of habitat by elk.
Habitat Type	An aggregation of all land areas potentially capable of producing similar plant communities at climax.
Hiding Cover	Trees of sufficient size and density to conceal animals from view at 200 feet. See Cover.
HUC	Hydrologic Unit Code
Hydrologic Recovery	The process of revegetation of a disturbed area which returns the site to predisturbance levels of water runoff and timing of flow.

I

ICBEMP	Interior Columbia Basin Ecosystem Management Project
IDAPA	Idaho Administrative Procedures Act
IDEQ	Idaho Department of Environmental Quality
IDFG	Idaho Department of Fish and Game
IDL	Idaho Department of Lands
IDPR	Idaho Department of Parks and Recreation
IDT	Interdisciplinary Team

Indicator Species	Species identified in a planning process that are used to monitor the effects of planned management activities on viable populations of wildlife and fish, including those that are socially or economically important. See Management Indicator Species.
Indigenous	Having originated in and being produced, growing, living, or occurring naturally in a particular region or environment.
Indirect Effects	Indirect effects are caused by the action and occur later in time or further removed in distance, but are still reasonably foreseeable.
INFISH	Inland Native Fish Strategy (July 28, 1995)
INFRA	Infrastructure Database (the database of record for Forest Service roads and trails)
Interdisciplinary Team; ID Team; IDT	Interdisciplinary Team. A group of individuals with different training assembled to solve a problem or perform a task. The team is assembled out of recognition that no one scientific discipline is sufficiently broad to adequately solve the problem. Through interaction, participants bring different points of view to bear on the problem.
Invasive Species	Any non-native plant, such as spotted knapweed or yellow star thistle, which when established may become destructive and difficult to control by ordinary means of cultivation or other control practices.
Inventory Data	Recorded measurements, facts, evidence, or observations of forest resources such as soil, water, timber, wildlife, range, geology, minerals, and recreation, which is used to determine the capability and opportunity of the forest to be managed for those resources.
IPM	Integrated Pest Management
IRA	Inventoried Roadless Area
Irretrievable	Foregone or lost production, harvest, or use of renewable natural resources. For example, when fire destroys a tree plantation, the effect is irretrievable but the loss of site productivity as measured by the presence of trees is not irreversible.

Irreversible	The removal of resources such that they cannot be produced gain. This applies most commonly to nonrenewable resources such as minerals or cultural resources, or to resources such as soil productivity that are renewable only over long periods of time. Loss of renewable resources can also be irreversible as in the replacement of a forest with a road.
Issue	A subject or question of widespread public discussion or interest regarding management of National Forest System lands.

K

Key Wildlife Habitat Components	Areas or features of the forest which are of particular importance for maintaining overall wildlife habitat. These areas and features include moist areas, wallows, meadows, parks, critical hiding cover, thermal cover, migration routes, and staging areas.

L

Land Allocation	The assignment of a management emphasis to particular land areas to achieve the goals of the issues, concerns, and opportunities identified during the planning process.
Landtype; Landtype Association; LTA	Landtype Association. An area of land classified on the basis of geomorphic attributes. An understanding of geologic processes, as reflected in land surface form and features, individual kinds of soil, and the factors which determine the behavior of ecosystems (i.e., climate, vegetation, relief, parent materials, and time) is used as the basis for this classification system.
LAU	Lynx Analysis Unit

M

MA	Management Area
MA 1	Provide the minimum management necessary to provide for resource protection and to ensure public safety. Additional road construction will be allowed to manage adjacent areas.

MA 2	Provide and maintain sites for facilities necessary for the administration of Nez Perce National Forest lands.
MA 3	Manage to ensure that prehistorical, historical, archaeological, and/or paleontological sites are studied, preserved, or protected.
MA 4	Encourage valid exploration and development of mineral resources while minimizing surface impacts from mineral activities.
MA 6	Manage areas for nonmanipulative research, observation, and study of undisturbed ecosystems.
MA 7	Manage for developed recreation opportunities, providing interpretation and enhancement of cultural and natural resources. Maintain or enhance existing developed recreation sites.
MA 8.1, 8.2, 8.3	Manage for outstandingly remarkable values and free-flowing river conditions as specified in the Wild and Scenic Rivers Act of 1968, as amended.
MA 9.1, 9.2, 9.3	Manage the wilderness values as specified by the Wilderness Preservation Act of 1964.
MA 10	Manage to protect or enhance riparian-dependent resources.
MA 11	Manage for high fishery/water quality objectives, wildlife security, and high quality dispersed recreation with no additional roads.
MA 12	Manage for timber production and other multiple uses on a sustained yield basis.
MA 13	Manage for timber production and other multiple uses on a sustained yield basis while meeting visual quality objectives of retention or partial retention on those areas of medium to high visual sensitivity. This management area consists of intermingled acreages of lands similar to those found in management areas 12 and 17. The heterogeneous spatial mix of these lands is the primary reason for identifying them as unique management areas.

MA 14	Manage for timber production and other multiple uses on a sustained yield basis while meeting visual quality objectives of retention or partial retention and improving the quality of winter range habitat for deer and elk. This management area consists of intermingled acreages of lands similar to those found in management areas 12, 16, and 17. The heterogeneous spatial mix of these lands is the primary reason for identifying them as unique management areas..
MA 15	Manage for timber production and other multiple uses on a sustained yield basis while improving the quality of deer and elk winter range. This management area consists of intermingled acreages of lands similar to those found in management areas 12 and 16. The heterogeneous spatial mix of these lands is the primary reason for identifying them as unique management areas.
MA 16	Manage to increase usable forage for elk and deer on potential winter range.
MA 17	Manage for timber production and other multiple uses on a sustained yield basis while meeting visual quality objectives of retention or partial retention.
MA 18	Manage to improve the quality of winter range habitat for deer and elk through timber harvesting or prescribed burning while meeting visual quality objectives of retention or partial retention on appropriate areas. This management area consists of intermingled acreages of lands similar to those found in management areas 16 and 17. The heterogeneous spatial mix of these lands is the primary reason for identifying them as unique management areas.
MA 19	Manage for livestock forage production and other multiple uses on a sustained yield basis.
MA 20	Manage for old-growth habitat for dependent species.
MA 21	Manage grand fir-Pacific yew communities for moose winter range and other multiple uses.
MA 22, 23	Manage to ensure that the Idaho water quality standards for community public supply water uses are met.

Management Area	An aggregation of capability areas which have common management direction and may be noncontiguous in the forest. Consists of a grouping of capability areas selected through evaluation procedures and used to locate decisions and resolve issues and concerns.
Management Practice	A technique or procedure commonly applied to forest resources, resulting in measurable outputs or activities.
Management Prescription	Management practices and intensities selected and scheduled for application on a specific area to attain multiple use and other goals and objectives.
Mine	A mining claim on which the claimant has gained title to all property rights; the land is no longer public domain, and is private property.
Mining Claims	A geographic area of the public lands held under the general mining laws in which the right of exclusive possession is vested in the locator of a valuable mineral deposit. Includes lode claims, placer claims, mill sites and tunnel sites.
Mitigation	Avoiding or minimizing impacts by limiting the degree or magnitude of the action and its implementation; rectifying the impact by repairing, rehabilitating, or restoring the affected environment; reducing or eliminating the impact by preservation and maintenance operations during the life of the action.
Management Direction	A statement of multiple use and other goals and objectives, the associated management prescriptions and the associated standards and guidelines for attaining them.
Management Indicator Species	A plant or animal which, by its presence in a certain location or situation, is believed to indicate the habitat conditions for many other species.
MIS	Management Indicator Species
Model	A theoretical projection in detail of a possible system of natural resource relationships. A simulation based on an empirical calculation to set potential or outputs of a proposed action or actions.
Monitoring	An examination, on a sample basis of Forest Plan management practices, to determine how well objectives have been met and a determination of the effects of those management practices on the land and environment.

MVUM	Motor Vehicle Use Map

N

NAGPRA	Native American Graves Protection and Repatriation Act of 1990
National Environmental Policy Act; NEPA Process	National Environmental Policy Act. An act to declare a national policy that will encourage productive and enjoyable harmony between man and his environment, to promote efforts that will prevent or eliminate damage to the environment and biosphere, and stimulate the health and welfare of man, to enrich the understanding of the ecological systems and natural resources important to the nation, and to establish a Council on Environmental Quality. An interdisciplinary process, mandated by the National Environmental Policy Act, which concentrates decisionmaking around issues, concerns, alternatives, and the affects of alternatives on the environment
National Forest Management Act	A law passed in 1976 as amendments to the Forest and Rangeland Renewable Resources Planning Act that require the preparation of Regional and Forest plans and the preparation of regulations to guide that development.
National Forest System	All National Forest lands reserved or withdrawn from the public domains of the United States; all National Forest lands acquired through purchase, exchange, donation, or other means; the National Grasslands and land utilization projects administered under Title III of the Bankhead-Jones Farm Tenant Act (50 Stat. 525, 7 U.S.C. 1010-1012); and other lands, waters, or interests therein which are administered by the Forest Service or are designated for administration through the Forest Service as part of the system.
National Recreation Trails	Trails designated by the Secretary of the Interior or the Secretary of Agriculture as part of the national system of trails authorized by the National Trails System Act. National recreation trails provide a variety of outdoor recreation uses in or reasonably accessible to urban areas.
National Register of Historic Places	A listing maintained by the National Park Service of areas which have been designated as being of historical value. The Register includes place of local and State significance as well as those of value to the nation as a whole.

Natural Sediment Production	The amount of sediment produced in a watershed prior to any management activities such as roads or harvest. Natural, or baseline, sediment is a function of parent material, soil type, degree of weathering, glacial influences, etc.
NEPA	National Environmental Policy Act
NEZSED	A computer model that analyzes and predicts effects of activities on water quality and quantity.
NF	NF National Forest
NFMA	National Forest Management Act
NFS	National Forest system
NHPA	National Historic Preservation Act
NMFS	National Marine Fisheries Service
No Action Alternative	An alternative where no management activities would occur beyond those currently under way. The development of a No Action Alternative is requested by regulations implementing the National Environmental Policy Act (40 CFR 1502.14). The No Action Alternative provides a baseline for estimating the effects of other alternatives.
NOAA	National Oceanic and Atmospheric Administration
NRHP	National Register of Historic Places
NPT	Nez Perce Tribe
NRLMD	Northern Rockies Lynx Management Direction

O

Objective	A specified statement of measurable results to be achieved within a stated time period. Objectives reflect alternative mixes of all outputs of achievements which can be attained at a given budget level. Objectives may be expressed as a range of outputs.

Off-Highway Vehicle; OHV	Off Highway Vehicle. Vehicles such as four and three wheelers, motorcycles, and bicycles which are designed to operate on primitive roads and trails, or to navigate cross country where there are no constructed travelways.
ORV	Off-Road Vehicle. Please see “Off-Highway Vehicle.”

P

PACFISH	The Decision Notice/Decision Record, Finding of No Significant Impact, and Environmental Assessment for the interim strategies for managing anadromous fish producing watersheds in eastern Oregon and Washington, Idaho, and portions of California. Published by the USDA Forest Service and USDI Bureau of Land Management in 1995.
Patented Mining Claim	A patent is a document which conveys title to land. When patented, a mining claim becomes private property and is land over which the United States has no property rights, except as may be reserved in the patent. After a mining claim is patented, the owner does not have to comply with requirements of the General Mining Law or implementing regulations.
Perennial Stream	A stream which normally flows throughout the year.
PILT	Payment in Lieu of Taxes
PL	Public Law
Preferred Alternative	The agency's preferred alternative, one or more, that is identified in the impact statement.
Prescription	Management practices selected and scheduled for application on a designated area to attain specific goals and objectives.
Productivity	See Site Productivity
Proposed Action	In terms of the National Environmental Policy Act, the project, activity, or action that a Federal agency intends to implement or undertake and which is the subject of an environmental analysis.
Public Access	Usually refers to a road or trail route over which a public agency claims a right-of-way available for public use.

Public Involvement	A Forest Service process designed to broaden the information based upon which agency decisions are made by (1) informing the public about Forest Service activities, plans, and decisions, and (2) encouraging public understanding about and participation in the planning processes which lead to final decision making.
Public Issue	A subject or question of widespread public interest relating to management of the National Forest System.

R

Range Allotment	A designated area of land available for livestock grazing upon which a specified number and kind of livestock may be grazed under a range allotment management plan. It is the basic land unit used to facilitate management of the range resource on National Forest System and associated lands administered by the Forest Service.
Ranger District	Administrative subdivision of the Forest supervised by a District Ranger.
RARE II	Roadless Area Review and Evaluation
Record of Decision	A document separate from but associated with an environmental impact statement that publicly and officially discloses the responsible official's decision about an alternative assessed in the environmental impact statement chosen for implementation.
Recreation Opportunity Spectrum	The framework for stratifying and defining classes of outdoor recreation environments, activities, and experiences which are arranged along a continuum or spectrum that is divided into seven classes: primitive, semi-primitive non-motorized, semi-primitive motorized, roaded modified, roaded natural, rural, and urban.
Recreation Visitor Day	Recreational use of National Forest developed sites or general forest areas which equals 12 visitor hours. A Recreation Visitor Day (RVD) may consist of 1 person for 12 hours, 12 persons for 1 hour, or any equivalent combination of continuous or intermittent recreation use by individuals or groups. 1 person in a campground for 24 hours equals 2 RVD’s.

Regional Guide	A document developed to meet the requirements of the Forest and Rangeland Renewable Resources Planning Act of 1974, as amended, that guides all natural resource management activities and established management standards and guidelines for National Forest System lands of a given Region to the national forest within a given Region. It also disaggregates the RPA objectives assigned to the Region to the Forests within that Region.
Revegetation	The reestablishment and development of plant cover. This may take place naturally through the reproductive processes of the existing flora or artificially through the direct action of man; eg., reforestation, range reseeding.
Right-Of-Way	Land authorized to be used or occupied for the construction operation, maintenance, and termination of a project facility passing over, upon, under, or through such land.
Riparian Areas	Areas with distinctive resource values and characteristics that are comprised of aquatic and riparian ecosystems, 100-year floodplains and wetlands. They also include all upland areas within a horizontal distance of approximately 100 feet from the edge of perennial streams or other perennial water bodies.
RMO	Resource Management Objective
ROS	Recreation Opportunity Spectrum
ROW	Right-of-Way
RNA	Research Natural Area
Road Management	The combination of both traffic and maintenance management operations. Traffic management is the continuous process of analyzing, controlling, and regulating uses to accomplish National Forest objectives. Maintenance management is the perpetuation of the transportation facility to serve intended management objectives.
Roadless Area	An area of National Forest which (1) is larger than 5,000 acres or, if smaller, is contiguous to a designated wilderness area or primitive area, 92) contains no roads, and (3) has been inventoried by the Forest Service for possible inclusion in the wilderness preservation system.

Roadless Area Review and Evaluation	A comprehensive process instituted in June 1977 to identify roadless and undeveloped land areas in the National Forest System and to develop alternatives for both wilderness and other resource management. The second roadless area review and evaluation was conducted on public lands in 1977. This inventory has been updated for this analysis to exclude any area affected by recent development and no longer considered roadless.
Rotation	The planned number of years between the formation of generation of trees and their harvest at a specified stage of maturity.
Rural	These areas are characterized by recreation sites that can be used by large numbers of people at one time.

S

SBW	Selway-Bitterroot Wilderness
Scoping	The procedures by which the Forest Service determines the extent of analysis necessary for a proposed action; i.e., the range of actions, alternatives and impacts to be addressed, identification of significant issues related to a proposed action, and establishing the depth of environmental analysis, data, and task assignments needed.
Security Area	Any area which, because of its geography, topography, and/or vegetation, will hold elk during periods of stress. For this project, a security area is defined as a block of dense forested cover at least 250 acres in size and located at least 1/2 mile from any roads open to motorized traffic during the general hunting season.
Sediment	Any material, carried in suspension by water, which will ultimately settle to the bottom of streams.
Sediment Delivery Efficiency	A term describing how efficiently sediment is transported within a given portion of a stream.
Sediment Yield	The amount of material eroded from the land surface by runoff and delivered to a stream system.
Semi-Primitive Non-Motorized	There is a high quality of experiencing solitude, closeness to nature, tranquility, self-reliance, challenge, and risk.

Semi-Primitive Motorized	There is a moderate opportunity for solitude, tranquility, and closeness to nature.
Sensitive Species	Species (plants or animals) with special habitat needs that may be influenced by management programs.
SHPO	State Historic Preservation Officer
Site Productivity	The production capability of specific areas of land.
Skid Trails	A travelway through the woods formed by loggers dragging (skidding) logs from the stump to a log landing without dropped a blade and without purposefully changing the geometric configuration of the ground over which they travel.
Slash	The residue left on the ground after felling and other silvicultural operations and/or accumulating there as a result of storm, fire, girdling, or poisoning.
Snag	A standing dead tree used by birds for nesting, roosting, perching, courting, or foraging for food and by some mammals for escape cover, denning, and reproduction.
Snowmobile	Any self-propelled vehicle under one thousand pounds unladened gross weight, designed primarily for travel on snow or ice or over natural terrain, which may be steered by tracks, skis, or runners. Also see “over-snow vehicle.”
Soil Productivity	The capacity of a soil to produce a specific crop such as fiber and forage, under defined levels of management. It is generally dependent on available soil moisture and nutrients and length of growing season.
Stand	A plant community of trees which possess uniformity in vegetation type, age class, vigor, size class, and stocking class and one which is distinguishable from adjacent forest communities.
Standard	An objective requiring a specific level of attainment; a rule to measure against; a guiding principle.

Stream Order	A measure of the position of a perennial stream in the hierarchy of tributaries. First order streams are unbranched streams; they have no tributaries. Second order streams are formed by the confluence of two or more first order streams. Third order streams are formed by the confluence of two or more second order streams; they are considered third order until they join another third order or larger stream.
Subnivean	A zone that is in or under the snow layer. It can form when latent heat from the ground melts a thin layer of snow above it, leaving a layer of air between the ground and the snow. Subnivean animals include small mammals such as mice, voles, shrews, and lemmings that must rely on winter snow cover for survival. These mammals move under the snow for protection from heat loss and predators
Successional Stage	A phase in the gradual supplanting of one community of plants by another.
Suitable Forest Land	Forest land (as defined in CFR 219.13) for which technology is available that will ensure timber production without irreversible resource damage to soils, productivity or watershed conditions; for which there is reasonable assurance that such lands can be adequately restocked (as provided in CFR 219.14), and for which there is management direction that indicates that timber production is an appropriate use of that area.
Supply Limited Stream	A supply (sediment) limited stream has more energy available during a typical year than there is sediment in the stream channel available to be moved. The excess energy leads to a resilience that enables the system to recover and cleanse itself if extreme sediment loads are not delivered in a short period of time.
System Road; Forest System Road	A road that is part of the Forest development transportation system, which includes all existing and planned roads, as well as other special and terminal facilities designated as Forest development transportation facilities.

T

Temporary Roads	Roads which are constructed for a one time or short term use which are not expected to be utilized in the future. These roads will be obliterated after the need is past.

Terrestrial	Living or growing on land; not aquatic.
Thermal Cover	Cover used by animals to ameliorate effects of weather; for elk, a stand of coniferous trees 40 feet or taller with an average crown closure of 70% or more.
Threatened Species	Any species that is likely to become an endangered species within the foreseeable future throughout all of a significant portion of its range and one that has been designated as a threatened species in the Federal Register by the Secretary of the Interior.
Timber	A general term for the major woody growth of vegetation in a forest area.
Timber Base	The lands within the Forest that are suitable for timber production.
TMDL	Total Maximum Daily Load
Topography	The configuration of land surface including its relief, elevation, and the position of its natural and man-made figures.
Trailhead	The parking, signing, and other facilities available at terminus of a trail.
Turbidity	Sediment or foreign particles stirred up or suspended in water.

U

Understory	Vegetation (trees or shrubs) growing under the canopy formed by taller trees.
Unsuitable Timber Land	Lands not selected for timber production are Step II and Step III of the suitability analysis during the development of the Forest Plan due to (1) the multiple use objectives for the alternative preclude timber production, (2) other management objectives for the alternative limit timber production activities to the point where management requirements set for thin 36 CFR 219.27 cannot be met, and (3) the lands are not cost efficient over the planning production. Land not appropriate for timber production shall be designated as unsuitable in the Forest Plan.
USC	United States Code
USDA	United States Department of Agriculture

USDI	United States Department of the Interior
USFS	United States Forest Service
USFWS	United States Fish and Wildlife Service

V

Viewshed	A total landscape as seen from a particular viewpoint.
Visual Quality Objectives; VQOs	The degree of acceptable alteration of the characteristic landscape.
Visual Resource	The composite of basic terrain, geologic features, water features, vegetative patterns, and land use effects that typify a land unit and influence the visual appeal the unit may have for visitors.

W

Wallow	A depression, pool of water, or wet area produced or utilized by elk or moose during the breeding season.
WATBAL	A computer model that analyzes and predicts effects of activities on water quality and quantity.
Watershed	The total area above a given point on a stream that contributes water to the flow at that point.
Wilderness Character	Wilderness character attributes are: Natural Integrity, Apparent Naturalness, Outstanding Opportunities for Solitude, and Opportunities for Primitive, Unconfined Recreation. These features were evaluated using capability analyses as conducted in 1978 using the Wilderness Attribute Rating (WAR) System and in 2005 using the Area Capability Assessment (ACA) Process. These analysis techniques rate wilderness character attributes as identified by the 1964 Wilderness Act.
WSRA	Wild and Scenic Rivers Act
WUI	Wildland Urban Interface

Chapter 6–References

Aber, J., N. Christensen, I. Fernandez, J. Franklin, L. Hidinger, M. Hunter, J. MacMahon, D. Mladenoff, J. Pastor, D. Perry, R. Slangen, and H. van Miegroet. 2000. Applying ecological principles to management of the U.S. National Forests. Issues in Ecology, Number 6, Spring 2000.

Adams, Rick Alan. *Bats of the Rocky Mountain West: natural history, ecology, and conservation*. Boulder, CO: University Press of Colorado, 2003.

Agee, J. K. 1993. Fire Ecology of Pacific Northwest forests. Washington, DC: Island Press.

Agee, J. K. 1997. The Severe Weather Wildfire – Too Hot to Handle? Northwest Science forum.

Ager, A. A., and C. Clifton. 2005. Software for calculating vegetation disturbance and recovery by using the equivalent clearcut area model. Gen. Tech. Rep. PNW-GTR-637. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 11 p.

Alexander, G. R., and E. A. Hansen. 1983. Sand sediments in a Michigan trout stream. Part II. Effects of reducing sand bedload on a trout population. North American Journal of Fisheries Management 3:365–372.

Alexander, G. R., and E. A. Hansen. 1986. Sand bed load in a brook trout stream. North American Journal of Fisheries Management 6:9–23.

Anderson, D. E., S. E. DeStefano, M. I. Goldstein, K. Titus, C. Crocker-Bedford, J. J. Keane, R. G. Anthony, and R. N. Rosenfield. 2005. Technical review of the status of northern goshawks in the western United States. Journal of Raptor Research 39:192–209.

Anderson, P.D. and N.J. Poage. 2014. The density management and riparian buffer study: A large-scale silviculture experiment informing riparian management in the Pacific Northwest, USA. Forest Ecology and Management 316: 90-99.

Anderson, P. G. 1996. Sediment generation from forestry operations and associated effects on aquatic ecosystems. Proceedings of the Forest-Fish Conference, Land Management Practices Affecting Aquatic Ecosystems, May 1–4, 1996, Calgary, Alberta.

Archer, D. R. 1989. Flood wave attenuation due to channel and floodplain storage and effects on flood frequency. In: Beven, K.; Carling, P. eds. Floods: hydrological, sedimentological, and geomorphological implications. Chichester, England, John Wiley and Sons: 37–46.

Archer, V. 2008. Clearwater Soil Monitoring: Soils Report. Orofino, ID: U.S. Department of Agriculture, Forest Service, Clearwater National Forest.

Arnett, E. B., & Hayes, J. P. (2009). Use of conifer snags as roosts by female bats in western Oregon. *The Journal of Wildlife Management*, *73*(2), 214-224.

Arno, S. F., D. J. Parsons, and R. E. Keane. 2002. Mixed-severity fire regimes in the northern Rocky Mountains: consequences of fire exclusion and options for the future. In: Cole, David N.; McCool, Stephen F.; Borrie, William T.; O'Loughlin, Jennifer, comps. 2000. Wilderness science in a time of change conference-Volume 5: Wilderness ecosystems, threats, and management; 1999 May 23–27; Missoula, MT. Proceedings RMRS-P-15-VOL-5. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. p. 225-232.

Badry, M. J. "Fisher (Martes pennanti). 2004." *Accounts and Measures for Managing Identified Wildlife Accounts V* (2004).

Baicich, P. J., and C. J. O. Harrison. 1997. A guide to nests, eggs, and nestlings of North American birds. Academic Press, San Diego, California.

Barclay, R., and A. Kurta. "Ecology and behavior of bats roosting in tree cavities and under bark." In: Bats in forests: conservation and management (MJ Lacki, JP Hayes, and A. Kurta, eds.). Johns Hopkins University Press, Baltimore, Maryland (2007): 17–59.

Barry, G. 2002. Commercial logging caused wildfires. Portland Independent Media Center. Available at: Portland.indymedia.org. Accessed on: 8/23/2002.

Barry, J. B. 1999. Stop the logging, start the restoration. The planet newsletter, Volume 6, Number 5, June 1999. www.sierraclub.org.

Bartelt, P. E., C. R. Peterson, and R. W. Klaver. 2004. Sexual difference in the post-breeding movements and habitats selected by western toads (*Bufo boreas*) in southeastern Idaho. Herpetologica 60(4): 455–467.

Belt, G.H., J. O'Laughlin, and T. Merrill. 1992. Design of Forest Riparain Buffer Strips for the Protection of Water Quality; Analysis of Scientific Literature. Idaho Forest, Wildlife and Range Policy Group, Report No.8.

Benachour, N., and Gilles-Eric Seralini. 2008. Glyphosate formulations induce apoptosis and necrosis in human umbilical, embryonic, and placental cells. Chem. Res. Toxicol., 2009, 22(1): 97–105 DOI: 10.1021/tx800218n, publication date (Web): December 23, 2008. http://pubs.acs.org/doi/abs/10.1021/tx800218n

Berglund, D., R. Bush, and R. Lundberg. 2008 Region One Vegetation Council Existing Forested Vegetation Classification System and Application to Inventory and Mapping. USDA FS, Region 1, Report 08-02 version 4.0. February 8, 2008.

Bessie, W. C., and E. A. Johnson. 1995. The relative importance of fuels and weather on fire behavior in subalpine forests. Published in Ecology, Vol. 76, No. 3, pp. 747-762.

Beyond Pesticides Daily News Blog. 2011. Report shows government-industry conflict in pesticide research. www.beyondpesticides.org

Beyond Pesticides. 2009. ChemicalWATCH factsheet. August 2009. http://www.beyondpesticides.org/pesticides/factsheets/Glyphosate.pdf

Bjornn, T. C., M. A. Brusven, M. P. Molnau, J. H. Milligan, R. A. Klampt, E. Chacho, and C. Shaye. 1977. Transport of granitic sediment in streams and its effects on insects and fish. Moscow, ID: University of Idaho, Forest, Wildlife, and Range Experiment Station. Water Resource Institute, Proj. B-036-IDA.

Black, T., C. Luce, R. Cissel, N. Nelson, and J. Thornton. 2013. Inventory and Modeling the Hydro-geomorphic Impacts of Forest Roads on the Middle Fork of the Payette River, Idaho. In proceedings: Resource Roads in British Columbia: Environmental challenges at the site level, Columbia Mountains Institute of Applied Ecology, November 7-8, 2012 Cranbrook, British Columbia, Canada.

Boisvenue, C., and S.W. Running 2010. Simulations show decreasing carbon stocks and potential for carbon emissions in Rocky Mountain forests over the next century. Ecological Applications 20(5): 13-2-1319.

Bollenbacher, B., R. Bush, and R. Lundberg. 2009. Estimates of snag densities for northern Idaho forests in the Northern Region. Missoula, MT: US Forest Service, Northern Region. Available at: http://fsweb.r1.fs.fed.us/forest/inv/fia_data/nid_snag_esti_12_09.pdf

Bonar, R. L. *Pileated Woodpecker habitat ecology in the Alberta foothills*. Diss. University of Alberta, 2001.

Bonnot, T. W., Rumble, M. A., & Millspaugh, J. J. (2008). Nest success of Black-backed Woodpeckers in forests with mountain pine beetle outbreaks in the Black Hills, South Dakota. *The Condor*, *110*(3), 450-457.

Borga, M., F. Tonelli, G. Dalla Fontana, and F. Cazorzi. 2003. Evaluating the effects of forest roads on shallow landsliding. Geophysical Research Abstracts, vol. 5, 13312, 2003.

Bosch, J. M., and J. D. Hewlett. 1982. A review of catchment experiments to determine the effect of vegetation changes to water yield and evapotranspiration. J. Hydrology, 55:3–23.

Boyce, M. S., J.S. Mao, E.H. Merrill, D. Fortin, M.G. Turner, J. Fryxell, and P. Turchin. (2003). Scale and heterogeneity in habitat selection by elk in Yellowstone National Park. *Ecoscience*, 421-431.

Brackebusch, A. P. 1973. Fuel Management – A prerequisite, not an alternative to fire control. Journal of Forestry.

Brawn, Jeffrey D., and Russell P. Balda. "Population biology of cavity nesters in northern Arizona: do nest sites limit breeding densities?." *Condor* (1988): 61–71.

Breashears, D. D., and C. D. Allen. 2002. The importance of rapid, disturbance-induced losses in carbon management and sequestration. Global Ecology and Biogeography 11:1-5.

Brister, D. 1998. Forest Service roads: a synthesis of scientific information (socio-economic impacts). www.wildlandscpr.org. December 11, 1998.

Broek, Hans van den. 2008. Glyphosate kills bees. The Institute of Science in Society. Science in Society #38, summer 2008. Letter to the editor.

Brown, K. R., W. M. Aust, and K. J. McGuire. 2013. Sediment delivery from bare and graveled forest road stream crossing approaches in the Virginia Piedmont. Forest Ecology and Management, 310 (2013) 836–846

Bryan, Susan Montoya. 2007. Former Forest Service official files lawsuit over firing. Earthhopenetwork.net

Bull, E. L., Nielsen-Pincus, N., Wales, B. C., & Hayes, J. L. (2007). The influence of disturbance events on pileated woodpeckers in Northeastern Oregon. *Forest Ecology and Management*, *243*(2), 320-329.

Bull, E. L. 2006. Sexual differences in the ecology and habitat selection of western toads (Bufo boreas) in northeastern Oregon. Pacific Northwest Research Station La Grande, OR. Herpetologicial Conservation and Biology 1(1):27-38. Available: http://www.herpconbio.org/volume_1/issue_1/Bull_2006.pdf

Bull, E.L., T.W. Heater, A.A. Clark, J.F. Shepherd, and A.K. Blumton. 2005. Influence of precommercial thinning on snowshoe hares. USDA For. Ser. Pac. N. Res. Sta. PNW-RP-562. 19 pp.

Bull, E. L., & Heater, T. W. (2000). Resting and denning sites of American martens in northeastern Oregon.

Bull, E.L., Parks, C.G., Torgerson, T.R., 1997. Trees and logs important to wildlife in the interior Columbia River basin. USDA Forest Service General Technical Report PNW-GTR-391.

Bull, E. L., and J. A. Jackson. 1995. Pileated woodpecker (Dryocopus pileatus). No. 148. A. Poole, and F. Gill, editors. The Academy of Natural Sciences, Philadelphia, Pennsylvania, and The American Ornithologists' Union, Washington, DC, USA.

Bull, E. L., and R. S. Holthausen. 1993. Habitat use and management of pileated woodpeckers in northeastern Oregon. Journal of Wildlife Management 57: 335-345.

Bull, Evelyn L., Richard S. Holthausen, and Mark G. Henjum. "Roost trees used by pileated woodpeckers in northeastern Oregon." *The Journal of wildlife management* (1992): 786-793.

Bull, E.L, S.R. Peterson, and J.W. Thomas. 1986. Resource partitioning among woodpeckers in Northeastern Oregon. USDAFS, PNRS, Research Note PNW-444, 20pp

Burns, James W. 1972. Some effects of logging and associated road construction on northern California streams. California Department of Fish and Game, Sacramento, California, 95814.

Burroughs, E. R. Jr. 1990. Predicting onsite sediment yield from forest roads. Proceedings of Conference XXI, International Erosion Control Association, Erosion Control: Technology in Transition. Washington DC, February 14-17, 1990. Pages 223-232.

Burroughs, E.R., Jr. and J. G. King. 1985. Surface erosion control on roads in granitic soils. Proceedings of Symposium Sponsored by Committee on Watershed Management, Irrigation & Drainage Div., ASCE, ASCE Convention, Denver, CO, April 30-May 1, 1985. 183-190.

Burroughs, E.R. and J.G. King. 1989. Reduction of soil erosion on forest roads. General Technical Report INT-264. USDA-Forest Service, Intermountain Research Station, Odgen, UT. July 1989. 21 p.

Bush, R. and R. Lundberg. 2008. Wildlife habitat estimates updates for the Region One Conservation Assessment: Region One Vegetation Classification, Mapping, Inventory and Analysis Report 08-04 v1.0.

Buskirk, S. W., and R. A. Powell. 1994. Habitat ecology of fishers and American martens, martens, sables, and fishers. S. W. Buskirk, A. S. Harestad, M. G. Raphael, and R. A. Powell, editors. Cornell University Press, Ithaca, New York, USA.

Buskirk, S. W., and L. F. Ruggiero. 1994. The American marten. Pages 7-38 in American marten, fisher, lynx, and wolverine in the western United States. Ruggiero, L. F., K. B. Aubrey, S. W. Buskirk, L. J. Lyon, and W. J. Zielinski, editors. USDA Forest Service General Technical Report RM-254, Fort Collins, Colorado, USA.

Byler, J. W., and S. K. Hagle. 2000, Successional Functions of Pathogens and Insects for Ecoregion Sections M332a and M333d in Northern Idaho and Western Montana-Volume 2-Results and Conclusions. Forest Service, State and Private Forestry, Forest Health Protection, Northern Region, FHP Report No. 00-11, July 2000.

Byler, J. W., and S. Zimmer-Gorve. 1990. A Forest Health Perspective on Interior Douglas-fir Management. In Interior Douglas-fir: The Species and Its Management. Washington State University, Dept. of Natural Resource Sciences, Cooperative Extension. Page 103.

Cary, Stephen, Tanja Crk, Colleen Flaherty, Pamela Hurley, James Hetrick, Keara Moore, and Silvia C. Termes. 2008. Risks of glyphosate use to federally threatened California reg-legged frog (*Rana aurora draytonii*) – pesticide effects determination. A report by the Environmental Fate and Effects Division Office of Pesticide Programs, Washington. D.C. 20460, October 17, 2008.

Center for Biological Diversity. 2009. Western leopard frogs move a step closer to protection – U.S. Fish and Wildlife Service: pesticides, disease, invasive species, and habitat loss may threaten native frogs with extinction. News release. June 30, 2009. http://www.biologicaldiversity.org/news/press_releases/2009/western-leopard-frog-06-30-2009.html.

Chapin, T. G., Harrison, D. J., & Phillips, D. M. (1997). Seasonal habitat selection by marten in an untrapped forest preserve. *The Journal of wildlife management*, 707-717.

Cheeseman, Gina-Marie. 2009. Can a company that makes roundup be sustainable? Opinion. www.triplepundit.com

Christensen, A. G., Lyon, L. J., & Unsworth, J. W. (1993). Elk management in the Northern Region: considerations in forest plan updates or revisions. USDAFS IMRS GTR-INT-303: 12pp.

Cissel, R., T. Black, N. Nelson and C. Luce. 2013. Center Horse and Morrell/Trail GRAIP Roads Assessment, Preliminary Report. Clearwater River Watershed, Lolo National Forest, Montana. US Forest Service, Rocky Mountain Research Station, Boise, ID.

Clayton, J. L. 1981. Soil disturbance caused by clearcutting and helicopter yarding in the Idaho batholith. Ogden, UT: U.S. Dept. of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. Research note INT-305.

Clayton, J. L. 1990. Soil disturbance resulting from skidding logs on granitic soils in central Idaho. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Forest and Range Experiment Station. Research note INT-436.

Cleland, D. T., P. E. Avers, W. H. McNab, M. E. Jensen, R. G. Bailey, T. King, And W. E. Russell. et al. 1997. National hierarchical framework of ecological units. Published in: Boyce, M.S. Hanley, A., eds. 1997. Ecosystem management applications for sustainable forest and wildlife resources. New Haven, CT: Yale University Press.

Coe, Nathan J. 2011. Forestry shouldn't be an "industry." Opinion. www.durangoherald.com. February 13, 2011.

Cohen, Jack D. Date??. Wildland-urban fire – a different approach.

Cohen, Jack and Jim Saveland. 1997. Structure ignition assessment can help reduce fire damages in the W-UI. US Forest Service, Rocky Mountain Research Station, Vol. 57 No. 4.

Cohen, Jack D. 1996. Modeling potential structure ignitions from flame radiation exposure with implications for wildland/urban interface fire management. Presented at the 13th Fire and Forest Meterology Conference. Lorne, Australia, 1996.

Cohen, Jack and Jim Saveland. 1997. Structure structure ignition assessment can help reduce fire damages in the W-UI. Published in Fire Management Notes, Volume 57 No. 4, 1997.

Cohen, Jack D. 1999. Reducing the wildland fire threat to homes: where and how much? US Forest Service, Rocky Mountain Research Station.

Cohen, Jack D. 2000. Preventing disaster: home ignitability in the wildland-urban interface. Published in the Journal of Forester 98(3): 15-21, 2000.

Cohen, Jack D. 2000. What is the wildland fire threat to homes? Presented as the Thompson Memorial Lecture, April 10, 2000. School of Forestry, Northern Arizona University, Flagstaff, AZ.

Cohen, Jack D., Nan Johnson, and Lincoln Walther, AICP. 2001. Saving homes from wildfires: regulating the home ignition zone. Published in Zoning News, May 2001.

Cohen, Jack D. 2000. Examination of the home destruction in Los Alamos associated with the Cerro Grande Fire July 10, 2000. USDA Forest Service, Rocky Mountain Research Station, Missoula, Montana, 2000.

Cohen, Jack. 2003. Thoughts on the wildland-urban interface fire problem. International Association of Wildland Fire.

Cohen, Jack. 2008. The wildland-urban interface fire problem. Forest History Today, Fall 2008.

Conant, R.T., K Paustian K, F García-Oliva, H.H. Janzen,V.J. Jaramillo, D.E. Johnson, S.N. Kulshreshtha 2007. Chapter 10 Agricultural and Grazing Lands. In: CCSP, 2007. *The First State of the Carbon Cycle Report (SOCCR): The North American Carbon Budget and Implications for the Global Carbon Cycle.* A Report by the U.S. Climate Change Science Program and the Subcommittee on Global Change Research [King, A.W., L. Dilling, G.P. Zimmerman, D.M. Fairman, R.A. Houghton, G. Marland, A.Z. Rose, and T.J. Wilbanks (eds.)]. National Oceanic and Atmospheric Administration, National Climatic Data Center, Asheville, NC, USA, 242 pp. http://www.climatescience.gov/Library/sap/sap2-2/final-report/sap2-2-final-all.pdf

Conroy, W. and K. Thompson. 2011. The implementation guide to Appendix A of the Nez Perce National Forest Plan. USDA Forest Service, Nez Perce National Forest.

Cooley, Patrick; Gary Dickerson, Tom Maffei, and Lis Novak. 2009. Scenic resource mitigation menu & design considerations for vegetation treatments. [Unpublished] Missoula, MT: U.S. Department of Agriculture, Forest Service, Northern Region. 8 p.

Cooper, S.V., K. E. Neiman, D. W. Roberts, 1991. Forest Habitat Types of Northern Idaho: A Second Approximation. USDA Forest Service, Intermountain Research Station, General Technical Report INT-236.

Copeland, J.P, K.S McKelvey, K.B. Aubry, A. Landa, J. Persson, R.M. Inman, J. Krebs, E. Lofroth, H. Golden, J.R. Squires, A. Magoun, M.K. Schwartz, J. Wilmot, C.L. Copeland, R.E. C.L. Copeland, R.E. Yates, I. Kojola, and R. May. 2010. The bioclimatic envelope of the wolverine (Gulo gulo): do climatic constraints limit its geographic distribution? Can. J. Zool. 88: 233-246.

Cox, Caroline. 1995. Glyphosate, part 1: toxicology. Journal of pesticide Reform, Volume 15, Number 3, Fall 1995. Northwest Coalition for Alternatives to Pesticides, Eugene, Oregon.

Cox, Caroline. 1995. Glyphosate fact sheets, part 1 and part 2. Journal of Pesticide Reform, Volume 15, Number 3, Fall 1995.

Crampton, L. H., & Barclay, R. M. (1998). Selection of Roosting and Foraging Habitat by Bats in Different-Aged Aspen Mixedwood Stands. *Conservation Biology*, *12*(6), 1347-1358.

Crawford, R. C. 1983. Pacific yew community ecology with implications to forest land man-agement in north central Idaho. Ph.D. Thesis, Univ. Idaho, Moscow. 109pp.

Croke, J., S. Mockler, P. Fogarty, and I. Takken. 2005. Sediment concentration changes in runoff pathways from a forest road network and the resultant spatial pattern of catchment connectivity. Geomorphology, 68, 257–268.

Crookston, N. L., 1999. Percent canopy Cover and Stand Structure from the Forest Vegetation Simulator. RMRS-GTR-24, USDA, Forest Service Rocky Mountain Research Station.

Cryan, P. M., Bogan, M. A., & Altenbach, J. S. (2000). Effect of Elevation on Distribution of Female Bats in the Black Hills, South Dakota. *Journal of Mammalogy*, 719-725.

Curran, M.P., R.L. Heninger, D.G, Maynard, and R.F. Powers. 2005a. Harvesting effects on soils, tree growth, and long-term productivity. In: C.A. Harrington and S.H. Schoenholtz eds. Productivity of western forests: A forest products focus. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. General Technical Report PNW-GTR-642.

Curran, M.P., R.E. Miller, S.W. Howes , D.G. Maynard, T.A. Terry, R.L. Heninger, T. Niemann, K. van Rees, R.F. Powers, S.H. Schoenholtz. 2005b. Progress towards more uniform assessment and reporting of soil disturbance for operations, research, and sustainability protocols. Forest Ecology and Management 220 (2005):17–30.

Cushman, John H. Jr. 1999. Audit faults Forest Service on logging damage in U.S. forests. www.nytimes.com, 2/5/1999.

Dale, V.H, L.A. Joyce, S. McNulty, R.P. Neilson, M.P. Ayres, M.D. Flannigan, P.J. Hanson, L.C. Irland, A.E. Lugo, C.J. Peterson, D. Simberloff, F.J. Swanson, B.J. Stocks, and B.M. Wotton. 2001. Climate change and forest disturbances. BioScience 51:723–734.

Damato, Dr. Gregory. 2009. GM-Soy: destroy the earth and humans for profit. www.fourwinds10.net

Damian, F. 2003. Cross-drain Placement to Reduce Sediment Delivery from Forest Roads to Streams. Masters Thesis. Univ. of Washington.

DeMaynadier, P. G. and M. L. Hunter. 2000. Road effects on emphibian movements in a forested landscape. Natural Areas Journal (2000), Volume 20, Issue 1, Pages 56-65.

Dixon, G. E., 2002. Essential FVS: A User’s Guide to the Forest Vegetation Simulator. USDA, Forest Service, Forest Management Service Center, Fort Collins, CO.

Dombeck, Michael P. 1998. Through the woods. The News Hour with Jim Lehrer Transcript, 6/19/98.

Dombeck, Michael P. 1998. Mike Dombeck's communication to his Forest Service underlings. www.wvhighlands.org, August 1998.

Dombeck, Mike. 1998. Chief Mike Dombeck's remarks to Forest Service employees and retirees. University of Montana, Missoula, Montana, February 20, 1998.

Dombeck, Michael P., Jack E. Williams, and Christopher A Wood. 2003. Wildfire policy and public lands: integrating scientific understanding with social concerns across landscapes. Published in Conservation Biology, Vol. 18, No. 4, August 2004, pages 883-889.

Dunne, T. and L. B. Leopold. 1978. Water in Environmental Planning. San Francisco: W. H. Freeman.

Edginton, Andrea N. Ph.D. 2000. Multiple stressor effects in amphibians: herbicide/pH interaction. A presentation at the 5th annual of the Canadian Amphibian and Reptile Conservation Network, September 22-25, 2000. http://www.carcnet.ca/past_meetings/2000/pastmeeting2000.php

Echochem. 2003. Glyphosate disrupts of human hormones. An interview with Professor Gilles-EricSeralini Ph.D. First published in Pesticides News No. 63, page 4. March 2003. http://www.ecochem.com/ENN_glyphosate(2).html

Editorial. 2009. Do seed companies control GM crop research? Published in Scientific American, July 21, 2009.

EFETAC. Undated. Forest fragmentation and roads. www.forestthreatsorg

Ehrlich, Dr. Anne, Dr. David Foster, and Dr. Peter Raven. Call to end logging based on conservation biology. www.nativeforest.org, 5/30/2002.

Elliott, William J., Deborah Page-Dumroese, and Peter R. Robichaud. 1996. The effects of forest management on erosion and soil productivity. Forest.moscowfsl.wsu.edu.

Engle, J.C., and C.E. Harris. 2001. Idaho Species of Special Concern Element State Ranking Reviews. Nongame and Endangered Wildlife Program, Conservation Data Center, Idaho. Department of Fish and Game. 104 p.

Espinosa, A. 1992. DFC fisheries model and analysis procedures, A training module. Orofino, ID: U.S. Department of Agriculture, Forest Service, Clearwater National Forest.

FEMAT, 1993. Forest ecosystem management: An ecological, economic, and social assessment. Report of the Forest Ecosystem Management Assessment Team. U. S. Department of Agriculture, Forest Service; U.S. Department of Commerce, Interior, and EPA.

Finney, M.A., and J.D. Cohen. 2003. Expectation and evaluation of fuel management objectives. In: P.N. Omi (ed.) Proceedings of fire, fuel treatments, and ecological restoration, April 14-17 Fort. Collins CO. U.S. Department of Agriculture, Forest Service Proceedings RMRS-P-29, PP 353-366. PF DOC. FF-31

Fleming R.L., R.F. Powers, N.W. Foster, J.M. Kranabetter, D.A. Scott, F. Ponder Jr., S. Berch, W.K Chapman, R.D. Kabzems, K.H. Ludovici, D.M. Morris, D.S. Page-Dumroese, P.T. Sandborn, F.G. Sanchez, D.M. Stone, and A.E. Tiarks. 2006. Effects of organic matter removal, soil compaction, and vegetation control on 5-year seedling performance: A regional comparison of long-term soil productivity sites. Canadian Journal of Forest Research 36:529–550.

Foltz, R. B., K A. Yanosek, and T. M. Brown. 2008. Sediment concentration and turbidity changes during culvert removals. Journal of Environmental Management 87 (2008) 329-240.

Foltz, R.B., H. Rhee, and K.A. Yanosek, 2007. Infiltration, erosion, and vegetation recovery following road obliteration. Transactions of the ASABE. 50(6): 1937-1943.

Foltz, R. B. 1996. Traffic and no-traffic on an aggregate surfaced road: sediment production differences. Presented at the Food and Agriculture Organization (FAO) seminar on "Environmentally Sound Forest Roads", June 17-22, 1996, Sinaia, Romainia. 13 p.

Forest Conservation News today. 2002. Bush fire policy: clearing forests so they do not burn. Forests.org. August 27, 2002.

Fowler, W.B., J.D. Helvey, and E.N. Felix. 1987. Hydrologic and climatic changes in three small watersheds after timber harvest. USDA Forest Service, Pacific Northwest Research Station. Res. Paper PNW-RP-379. Portland Oregon.

Fox, Joseph W. and Timothy Ingalsbee, Ph.D. 1998. Fuel Reduction for Firefighter Safety. Published in Proceedings of the International wildland Fire Safety Summit, Winthrop, WA.

Frankel, S.J, 1998. Technical Coordinator, User's Guide to the Western Root Disease Model, Version 3.0. PSW-GTR-165, USDA, Forest Service, Pacific Southwest Research Station.

Franklin, J.F., D.R. Berg, D.A. Thornburg, J.C. Tappeiner. 1997. Alternative silvicultural approaches to timber harvesting: variable retention harvest systems. In: Kohm, K.A.

Franklin, J.F. and K. N. Johnson. 2010. Applying Restoration Principles on the BLM O&C Forests in Southwest Oregon. Unpublished

Franklin, J.F. and K. N. Johnson. 2011a. Moist Forest Principles and Prescriptions (Emphasizing the creation of diverse early successional ecosystems through variable retention regeneration harvest). Unpublished

Franklin, J.F. and K. N. Johnson. 2011b. A Guide to Creating Diverse Early Successional Ecosystems through Veriable Retention Regeneration Harvest on the Coos Bay District of the BLM. Unpublished.Franklin, Jerry Ph.D., David Perry Ph.D., Reed Noss Ph.D., David Montgomery Ph.d., and Christoher Frissell

Ph.d. 2000. Simplified forest management to achieve watershed and forest health: a critique.

Frey, David. 2010. Logging won't halt beetles, fire, report says. Newwest.net. March 3, 2010.

Frissell, C. A., and D. Bayles. 1996. Ecosystem management and the conservation of aquatic biodiversity and ecological integrity. Water Resources Bulletin 32: 229-240.

Froehlich, H. A. and McNabb, D.H. 1983. Minimizing soil compaction in Pacific Northwest forests. In: E. L. Stone (ed). Forest soils and treatment impacts. Proceedings of Sixth North American Forest Soils Conference. Knoxville, TN: University of Tennessee.

Froehlich, H.A., D.W. R. Miles, and R.W. Robbins. 1983. Soil bulk density recovery on compacted skid trails in central Idaho. Soil Science Society of America Journal 49:1015 1017.

Froehlich, H.A. and P.W. Adams. 1984. Compaction of forest soils. Pacific Northwest Extension. PNW-217.

Furniss, Michael J, Michael Love Ph.D. and Sam A Flanagan. Diversion potential at road-stream crossings. USDA Forest Service. 9777 1814-SDTDC. . www.stream.fs.fed.us. December 1997.

Gable, Eryn. 2010. Battling beetles may not reduce fire risks – report. www.xerces.org. March 4,2010.

Galik, C.S. and R.B. Jackson. 2009. Risks to forest carbon offset projects in a changing climate. Forest Ecology and Management 257 (2009) 2209–2216.

Gammon, Crystal and Environmental Health News. 2009. Weed-whacking herbicide proves deadly to human cells. Published in Scientific American, June 23, 2009. http://www.scientificamerican.com/article.cfm?id=weed-whacking-herbicide-p

Gan and McCarl. 2007 J. Gan and B.A. McCarl, Measuring transnational leakage of forest conservation, Ecological Economics 64 (2007), pp. 423–432.

Garbrecht, J. 1991. Effects of spatial accumulation of runoff on watershed response. Journal of Environmental Quality 20:31-25.

General Accounting Office. 1990. Lawn care pesticides: risks remain uncertain wile prohibited safety claims continue. GSO/RCED-90-134. March 1990.

Ghalambor, C.K. and R.C. Dobbs. (2006, August 10). Pygmy Nuthatch (*Sitta pygmaea*): a technical conservation assessment. [Online]. USDA Forest Service, Rocky Mountain Region.

Gerhardt, N. 2000. A brief history of water yield and ECA guidelines on the Nez Perce National Forest. Unpublished report available at the Nez Perce National Forest , Grangeville, ID. 4p.

Gillam, Carey. 2010. Patents trump public interest in Monsanto's ag empire. www.commondreams.org

Giuliano, Jackie Alan, Ph.D. Fire suppression Bush style: cut down the trees! Healing Our World, Weekly Comment. www.ens-newswire.com, 8/23/2002.

Gorte, Ross W. 1995. Forest Service timber sale practices and procedures: analysis of alternative systems. CRS Report for Congress. 95-1077 ENR. October 20, 1995.

Govindarajulu, Purnima P. PhD. 2008. Literature review of impacts of glyphosate herbicide on amphibians: what risks can the silvicultural use of this herbicide pose for amphibians in B.C.? British Columbia Ministry of Environment, Wildlife Report No. R-28, June 2008.

Grace, J.M. III and B. D. Clinton. 2006. Forest Road Management to Protect Soil and Water. ASABE Paper No. 068010. Presented at ASABE Annual International Meeting, Portland, OR, July 9-12, 2006.

Grace, Johnny M III. 2003. Minimizing the impacts of the forest road system. In: Proceedings of the conference 34 international erosion control association; ISSN 1092-2806. [Place of publication unknown]: International Erosion Control Association: 301-310.

Grace, McFero J. III. 2004. Sediment plume development from forest roads: how are they related to filter strip recommendations: An ASAE/CSAE Meeting Presentation, Paper Number: 045015, August 1-4, 2004.

Graham, R.T., A.E. Harvey, M.F. Jurgensen, T.B. Jain, J.R. Tonn, and D.S. Page-Dumroese. 1994. Managing coarse woody debris in forests of the Rocky Mountains. Ogden UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. Research Paper INT-RP-477.

Graham, R.T., T.B. Jain, and A.E. Harvey. 1999. Fuel: Logs, sticks, needles, duff and much more. *In* Proceedings, Joint Fire Science Conference and Workshop. Crossing the millennium: integrating spatial technologies and ecological principles for a new age in fire management. L.F. Neunschwander, K.C. Ryan, G.E. Gollberg, and J.D. Greer (editors). Boise, ID.

Graham, R. T.; T. B.Jain. 2005. Ponderosa pine ecosystems In: Ritchie, Martin W.; Maguire, Douglas A.; Youngblood, Andrew, tech. coordinators. Proceedings of the Symposium on Ponderosa Pine: Issues, Trends, and Management, 2004 October 18-21, Klamath Falls, OR. General Technical Report PSW-GTR-198. Albany, CA: Pacific Southwest Research Station, Forest Service, U.S. Department of Agriculture: 1-32

Grant, G E.; S.L. Lewis, F.J. Swanson, J.H. Cissel, J.J. McDonnell. 2008. Effects of forest practices on peak flows and consequent channel response: a state-of-science report for western Oregon and Washington. Gen. Tech. Rep. PNW-GTR-760. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. 76 p.

Graves, Lucia. 2011. Roundup: birth defects caused by world's top selling weedkiller, scientists say. Huffington Post, June 24, 2011. http://www.commondreams.org/headline/2011/06/24-4

Green, P, J. Joy, D. Sirucek, W. Hann, A. Zack, and B. Naumann. 1992. Old-growth forest types of the Northern Region (errata corrected 2/2005). USDA Forest Service, Northern Region, Missoula, MT 59807. Available: http://fsweb.r1.fs.fed.us/forest/inv/project/old_growth.htm

Griffin, P.C., and L.S. Mills. 2007. Precommercial thinning reduces snowshoe hare abundance in the short term. J. Wild. Mgmt. 71(2) pp.

Groom, Jermiah, Liz Dent, and Lisa Madsen. 2011. Steam temperature change detection for state and private forests in the Oregon Coast Range. Water Resources Research, Vol. 47, W01501. DOI: 10.1029/2009WR009061.

Groves, C., T. Fredrick, G. Frederick, E. Atkinson, M. Atkinson, J. Shepard, and G. Servheen. 1997. Density, distribution, and habitat of flammulated owls in Idaho. Great Basin Naturalist 57: 116-123.

Gucinski, Hermann, Ph.D., Michael J. Furniss, Robert R. Ziemer, Ph.D., and Martha H. Brookes, Editors. 2001. Forest roads: a synthesis of scientific information. USDA Forest Service, General Technical Report PNW-GTR-509.

Guscio, C. G., B.R. Hossack, L.A. Eby, and P.S. Corn. 2007. Post-breeding habitat use by fboreal toads (Bufo Boreas) after wildire in Glacier National Park, USA. Herpetological conservation and Biology 3 (1): 55-62.

Gutiérrez, Ralph J., and David J. Delehanty. "Mountain Quail (Oreortyx pictus)." *The Birds of North America* 457 (1999): 28.

Hagle, S. K. 2006. Armillaria Root Disease and Management. USDA Forest Service, Forest Health Protection. Report 11.1.

Hann, W. J. et al. 1997. Landscape dynamics of the basin. Pp. 337-1055. In: Quigley, T. M. and s. J. Arbelbide (eds.). An assessment of ecosystem components in the interior Columbia Basin and portions of the Klamath and Great Basins: Volume II. USDA Forest Service, PNW-GTR-405.

Hann, W. J., and D.L. Bunnell. 2001. Fire and land management planning and implementation across multiple scales. International Journal of Wildland Fire 10:389-403.

Hanson, Chad. 2000. Commercial logging doesn't prevent catastrophic fires, it causes them. Opinion. The New York Times, 5/19/2000.

Hanson, Chad. 2001. Logging for dollars in national forests. Opinion. www.johnmuirproject.org. 11/14/2001.

Hanson, Chad. 2008. Logging industry misleads on climate and forest fires. Opinion. Newest.net, 7/11/2008.

Hardy, C. C., K. M. Schmidt, J. M. Menakis, and N. R. Samson. 2001. Spatial data for national fire planning and fuel management. International Journal of Wildland Fire 10:353-372.

Hargis, C. D., Bissonette, J., & Turner, D. L. (1999). The influence of forest fragmentation and landscape pattern on American martens. *Journal of applied Ecology*, *36*(1), 157-172.

Harmon, Mark E. 2009. Testimony before the Subcommittee on National Parks, Forests, and Public Lands of the Committee of Natural Resources for an oversight hearing on “The Role of Federal Lands in Combating Climate Change”, March 3, 2009. Includes attachments.

Harvey, A. E., J. W. Byler, G.I McDonald, L.F. Neuenschwander, J.R. Tonn. 2008. Death of an Ecosystem: Perspectives on Western White Pine Ecosystems of North America at the End of the Twentieth Century. Gen. Tech. Report. U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. RMRS-GTR-208.

Harvey, A. E., M. J. Larson, and M F. Jurgensen. 1976. Distribution of ectomycorrhizae in a mature douglas-fir/larch forest soil in western Montana. Published in Forest Science, Volume 22, Number 4, 12/1/1976, pp. 393-398(6).

Haskell, David G., Ph.D. 1999. Effects of forest roads on macroinvertebrate soil fauna of the southern Appalachian mountains. www.jstor.org.

Hawbaker, Todd J., Volker C. Radeloff, Murray K. Clayton, Roger B. Hammer, and Charlotte E. Gonzalez-Abraham. 2006. Road development, housing growth, and landscape fragmentation in northern Wisconsin: 1937-1999. Ecological Applications: Vol. 16, No. 3, pp. 1222-1237. http://www.esajournals.orgHayward, G. D., & Verner, J. (1994). Flammulated, boreal, and great gray owls in the United States: a technical conservation assessment. Gen. Tech. Rep. RM-253

Heath, L. S., J. E. Smith, C. W. Woodall, D. L. Azuma, and K. L. Waddell. 2011. Carbon stocks on forestland of the United States, with emphasis on USDA Forest Service ownership. Ecosphere 2(1):art6 doi:10.1890/ES10-00126.1

Heekin, Patricia E., and Kerry P. Reese. 1995. Validation of a mountain quail survey technique." Department of Fish and Wildlife Resources, University of Idaho, Moscow, ID.

Heekin, P.E. and C.A. Vogel. 1995. Mountain quail: High jumpers. Idaho Wildlife, IDFG, Boise, ID.

Heong, Chee Yoke. 2005. New evidence establishes dangers of roundup. Third World Resurgence, No. 176, April 2005. http://www.projectcensored.org/top-stories/articles/13-new-evidence-establishes-dangers-of-roundup/

Hill, Barry T. 1999. Western national forests: a cohesive streategy is needed to address catastrophic wildfire threats. GAO Technical Report, April 1999.

Hillis, J.M., M.J. Thompson, J.E. Canfield, L.J. Lyon, C.L. Marcum, P.M. Dolan, and D.W. McCleerey. 1991. Defining elk security: the Hillis paradigm. In Proceedings of elk vulnerability symposium. Edited by Christiansen, A.G., L.J. Lyon, and T.N. Lonner. Montana State University, Bozeman, Montana (Pages 38-43).

Ho, Mae-Wan Ph.D. 1998. Affadavit. http://www.i-sis.org.uk/greenpeace.php?printing=yes

Ho, Mae-Wan Ph.D. and Prof. Joe Cummins Ph.D. 2005. Glyphosate toxic & roundup worse. An Institute of Science in Society publication. July 3, 2005. http://www.i-sis.org.uk/GTARW.php

Houghton 2003 R. A. Houghton. Revised estimates of the annual net flux of carbon to the atmosphere from changes in land use and land management 1850–2000. *The Woods Hole Research Center, PO Box 296, Woods Hole, MA 02543, USA Published in Tellus (2003), 55B, 378–390 Blackwell Munksgaard, 200.*

Houston, Dr. Alan. 1997. Why forestry is in trouble with the public. Quote. Evergreen magazine, October 1997. Evergreenmagazine.com

Howe, Christina Ph.d., Michael Berrill Ph.D., and Bruce D. Pauli. 2001. The acute and chronic toxicity of glyphosate-based pesticides in northern leopard frogs. http://www.trentu.ca/biology/berrill/Research/Roundup_Poster.htm

Howie, R. R. and R. Ritcey. 1987. Distribution, habitat selection, and densities of Flammulated Owls in British Columbia. Pages 249-254 in Biology and conservation of northern forest owls. (Nero, R. W., R. J. Clark, R. J. Knapton, and R. H. Hamre, Eds.) U.S. For. Serv. Gen. Tech. Rep. RM-142.

Hoyt, J. S., & Hannon, S. J. (2002). Habitat associations of black-backed and three-toed woodpeckers in the boreal forest of Alberta. *Canadian Journal of Forest Research*, *32*(10), 1881-1888.

HR1494. 2001. National Forest Protection and Restoration Act of 2001. www.agriculturelaw.com

Hudack, A., I. Rickert, P. Morgan, E. Strand, S. A. Lewis, P. R. Robichaud, C. Hoffman, Z. A. Holden. 2011. Review of fuel treatment effectiveness in forests and rangelands and a case study from the 2007 megafires in central Idaho USA. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-252.

Hudak, Mike. 1997. From prairie dogs to oysters: how biodiversity sustains us. Originally published in EarthTimes, Newsletter of Earth Day Southern Tier, Binghamton, NY USA, February/March 1999, p. 2. www.mikehudak.com.

Huff, Mark H., Roger D. Ottmar, Ernesto Alvarado, Robert E. Vihnanek, John F. Lehmkuhl, Paul F. Hessburg, and Richard L. Everett. 1995. Historical and current forest landscapes in eastern Oregon and Washington. Part II: linking vegetation characteristics to potential fire behavior and related smoke production. USDA FS, Pacific Northwest Research Station, General Technical Report PNW-GTR-355, October 1995.

Hutto, R .L. 1995a. Composition of bird communities following stand replacement fires in Northern Rocky Mountain (U.S.A.) conifer forests. Conservation Biology 9: 1041-1058.

Hutto, R.L. 1995b. Black-backed Woodpecker.

Hutto, R.L. 2007. Black-backed Woodpecker.

Idaho County. 2009. Idaho County Revised Wildland-Urban Interface Wildfire Mitigation Plan Committee in cooperation with Northwest Management, Inc. 2009. Idaho County, Idaho, Wildfire Mitigation Plan.Idaho Department of Environmental Quality (IDEQ). 2003. Update of bull trout temperature requirements. Boise, ID.

Idaho Department of Environmental Quality (IDEQ). 2014. Idaho 2012 Integrated Report (303d/305b list). IDEQ, Boise, Idaho. Available at: http://www.deq.idaho.gov/media/1117323/integrated-report-2012-final-entire.pdf

Idaho Department of Environmental Quality (IDEQ). 1999. Lochsa River Subbasin Assessment. Lewsiton Regional Office, ID. Found at http://www.deq.idaho.gov/water-quality/surface-water/tmdls/table-of-sbas-tmdls/lochsa-river-subbasin.aspx

Idaho Department of Fish and Game (IDFG). 2005. Idaho Comprehensive Wildlife Conservation Strategy. Idaho Conservation Data Center, Idaho Department of Fish and Game. Boise, ID.

Idaho Department of Fish and Game (IDFG). 2008. Elk surveys and inventories progress report: Big game population status, trends, use and associated habitat studies. W-170-R-32. Boise, Idaho. 24-29.

Idaho Department of Fish and Game (IDFG). 2010. Idaho Conservation Data Center. Lynx.

Idaho Department of Fish and Game (IDFG). 2012. Idaho Supplementation Studies Brood Year 2009 Synthesis Report. IDFG Report Number 12-13. Boise, ID.

Idaho Department of Fish and Game (IDFG). 2014. Idaho Elk Management Plan 2014-2024. Idaho Department of Fish and Game, Boise, USA.

Idaho Digital Atlas. 2010. Available: http://imnh.isu.edu/digitalatlas/bio/amph/main/amphmnfr.htm. Accessed 9/17/12. Ring-necked snake.

Infowars Ireland. 2009. France finds Monsanto guilty of ying. Infowars Ireland, November 23, 2009.

Ingalsbee, Timothy, Ph.D. 1997. Logging for firefighting: acritical analysis of the quincy library group fire protection plan. Unpublished research paper for the Western Ancient forest Campaign. www.fre-ecoogy.org.

Ingalsbee, Timothy, Ph.D. 2000. Commercial logging for wildfire prevention: facts vs. fantasies. www.fire-ecology.org

Ingalsbee, Timothy Ph.D. 2000. Money to burn: the economics of fire and fuels management. Part one: fire suppression. www.ire-ecology.org. June 2000.

Ingalsbee, Timothy, Ph.D. 2002. From “Analysis Paralysis” to Agency-Community Collaboration in Fuels Reduction for Fire Restoration: A Success Story. Oral presentation to the conference on fire, fuel treatments, and ecological restoration: proper place, appropriate time, at Fort Collins, Colorado.

Ingalsbee, Timothy, Ph.D. 2002. Logging without limits isn't a solution to wildfires. Published in the Portland Oregonian on August 6, 2002.

Ingalsbee, Timothy, Ph.D. 2002. National fire plan implementation: Forest Service failing to protect forests and communities. American Lands Alliance. www.fire-ecology.org. March 2002.

Ingalsbee, Timothy, Ph.D. 2003. Fanning the flames! The U.S. Forest Service: a fire-dependent bureaucracy. Published in the Missoula Independent, Vol. 14, No. 24, June 2003.

Ingalsbee, Timothy, Ph.D.. 2005. National firefighters' group releases a reporter's guide to wildland fire. www.commondreams.org.

Ingalsbee, Timothy Ph.D. and Joseph Fox, Ph.D.. 2006. Firefighters united for safety, ethics, and ecology (FUSEE): torchbearers for a new fire management paradigm. Fusee.org

Interior Columbia River Basin Ecosystem Management Project. 1998. Economic and social conditions of communities: economic and social characteristics of interior Columbia basin communities and an estimation of effects on communities from the alternatives of the eastside and upper Columbia River Basin Draft Environmental Impact Statements. USDA-FS, USDI-BLM.

Idaho Partners In Flight. 2000. Mountain Quail.

Interagency Lynx Biology Team. 2013. Canada lynx conservation assessment and strategy, 3rd edition. USDA Forest Service, USDI Fish and Wildlife Service, USDI Bureau of Land Management, and USDI National Park Service. Forest Service Pub. #R1-13-19, Missoula, MT. 128 pp.

Isaak, D. J., Wollrab, S., Horan, D., & Chandler, G. (2012). Climate change effects on stream and river temperatures across the northwest US from 1980–2009 and implications for salmonid fishes. Climatic Change, 113(2), 499-524.

Isaak, D.J., Young, M.K., Nagel, D.E., Horan, D.L. and Groce, M.C. 2015. The cold-water climate shield: delineating refugia for preserving salmonid fishes through the 21st century. Global Change Biology, doi:10.11/gcb.12879

Ivins, Molly. 1997. Opinion. www.creators.com. August 3, 1997.

Jain, T. B., R. T. Graham. 2007. The Relation between Tree Burn Severity and Forest Structure in the Rocky Mountains. USDA Forest Service Gen. Tech. Rep. PSW-GTR-203. 2007.

James, Carrie. 2004. Aerial herbicide spraying. SitNews (Ketchikan, Alaska) June 19, 2004. Available at: http://www.sitnews.us/0604Viewpoints/061904_carrie_james.html

Johnsgard, Paul A. "Grouse and quails of North America." (1973).

Johnson, J. S., Lacki, M. J., & Baker, M. D. (2007). Foraging ecology of long-legged myotis (Myotis volans) in north-central Idaho. *Journal of Mammalogy*, *88*(5), 1261-1270.

Jones, J. L. 1991. Habitat use of fisher in northcentral Idaho. Thesis, University of Idaho, Moscow, Idaho, USA.

Jones, J.L. and E.O. Garton. 1994. Selection of successional stages by fishers in northcentral Idaho. p Pages 377-388 in Martens, sables and fishers: biology and conservation. S.W. Buskirk, A.S. Harestad, M.G. Raphael, R.A. Powell, eds. Comstock Publishing Associates, Ithaca, New York. 484 p.

Jones, Julia A., Frederick J. Swanson, Beverley C. Wemple, and Kai U. Snyder. 2000. Effects of roads on hydrology, geomorphology, and disturbance patches in stream networks. Conservation Biology 14, No. 1. 2000. www.jstor.org

Kahklen, Keith. 2001. A method for measuring sediment production from forest roads. Pacific Northwest Research Station, USDA Forest Service. Research note PNW-RN-529. April 2001.

Kapler-Smith, J. and Fischer, W.C. 1997. Fire Ecology of the Forest Habitat Types of Northern Idaho. United States Department of Agriculture, Forest Service, Intermountain Research Station, General Technical Report INT-GTR-363.

Kayatsky, Dan Okoand Ilan. 2002. Fight fire with logging? Opinion. www.motherjones.com. August 1, 2002.

Kauffman, J.B. and W.C. Krueger. 1984. Livestock impacts on riparian ecosystems and streamside management implications . . . A Review. J. Range Mgmt. 37(5):430-438.

Keane, R. E., S.F. Arno. 1996. Whitebark pine ecosystem restoration in western Montana., 1996., In: Hardy, Coliln C.; Arno, Stephen F., eds. The use of fire in restoration. General Technical Report. INT-GTR-341. Ogden, UT: U.S. Department of Agriculture, Forest Service, Intermountain Research Station. P. 51-53.

Keene, Roy. 2009. Logging does not prevent wildfires. Guest viewpoint published in the Eugene Register Guard, January 11, 2009.

Keene, Roy. 2011. Restorative logging? More rarity than reality. Guest viewpoint, the Eugene Register Guard, March 10, 2011.

Keinath, D.A. 2004. The fringed myotis (Myotis thysanodes): a technical conservation assessment. Prepared for the Rocky Mountain Region, USDA Forest Service, Species Conservation Project. 100pp.

Kelly, Steve. 2007. Cheap chips, counterfeit wilderness. Published in counterpunch.org, "America's Best Political Newspaper."

Kendall, C. N. 1999. Effects of timber harvest and road construction on watershed hydrology and water quality. USDA Forest Service, Dixie National Forest.

Kendall, C. N. 2011. Comparison of stream channel and aquatic habitat conditions in reference and managed watersheds. Flathead National Forest, Kalispell, MT.

Kennedy, P. L. 1997. The northern goshawk (Accipter gentilis atricapillus): is there evidence of a population decline. Raptor Research 31:95-106.

Kennedy, P. L. 2003. Northern goshawk (Accipiter gentilis atricapillus): a technical conservation assessment. Unpublished report, USDA Forest Service, Rocky Mountain Region, Species Conservation Project, Denver, Colorado, USA.

Keppeler, Elizabeth T., Robert R. Ziemer, and Peter H. Cafferata. 1994. Changes in soil moisture and pore pressure after harvesting a forested hillslope in northern California. Effects of Human-Induced Changes On Hydrologic Systems, American Water Resources Association, June 1994.

Kettle Range Conservation Group. 2001. From Chapter 3. Adverse impacts in the report: risky business: invasive species management on national forests – a review and summary of needed changes in current plans, policities and programs. A publication of the Kettle Range Conservation Group, February 2001. http://kettlerange.org/weeds/Chapter-3.html

Kimble-Evans, Amanda. Roundup weed killer kills more than weeds. Mother Earth News, December 2009-January 2010.

King, J. G. 1994. Streamflow and sediment yield responses to forest practices in north Idaho. In proceedings of Interior Cedar-Hemlock-White Pine Forest: Ecology and Mangement, held march 1993 in Spokane, WA. Department of Natural Resource Sciences, Washington State University, Pullman, WA 99164.

Kirk and Naylor. 1996. Pileated Woodpecker.

Klein, Al. 2004. Logging effects on amphibian larvae populatins in Ottawa National Forest. www.nd.edu

Knopf, F. L., Johnson, R. R., Rich, T., Samson, F. B., & Szaro, R. C. (1988). Conservation of riparian ecosystems in the United States. *The Wilson Bulletin*, 272-284.Koehler, Gary M., and Maurice G. Hornocker. "Fire effects on marten habitat in the Selway-Bitterroot Wilderness." *The Journal of Wildlife Management* (1977): 500-505.

Koehler, G. M., W.R. Moore, and A.R. Taylor. 1975. Preserving the pine marten: management guidelines for western forests. West. Wild. 2:31-36.

Korb, J. E., Johnson N. C., and Covington W.W. 2004. Slash pile burning effects on soil biotic and chemical properties and plant establishment: Recommendation for Amelioration. Restoration Ecology 12(1):52-62.

Krankina, O.N. and M.E. Harmon 2006. Forest Management Strategies for Carbon Storage. In: Forests, Carbon & Climate Change - Summary of Science Findings, Oregon Forest Resources Institute, pp. 79-92.

Lawren, Bill 1992. Singing the blues for songbirds. Opinion. www.nwf.org. August 1, 1992.

Lee, Philip, Cheryl Smyth and Stan Boutin. 2004. Quantatative review of riparian buffer width guidelines from Canada and the United States. Journal of Environmental Management 70 (2004) 165-180.

Leege, T.A. (1984). Guidelines for evaluating and managing summer elk habitat in northern Idaho. Idaho Department of Fish and Game Wildlife bulletin Number 11, 37pp.

Leitner, Brian. 2003. Logging companies are responsible for the California wildfires. Opinion. www.democraticunderground.com. October 30, 2003.

Leu, Andre. 2007. Monsanto's toxic herbicide glyphosate: a review of its health and environmental effects. Organic Producers Association of Queensland, May 15, 2007.

Littell, J.S., D. McKenzie, D.L. Peterson, and A.L. Westerling. 2009. Climate and wildfire area burned in western U.S. ecoprovinces, 1916-2003. Ecological Applications 19: 1003-1021.

Lloyd, Rebecca A., Kathleen A Lohse, and TPA Ferré 2013. Influence of road reclamation techniques on forest ecosystem recovery. *Frontiers in Ecology and the Environment* **11**: 75–81.

Long, Cheryl. 2005. Hazards of the world's most common herbicide. Mother Earth News, October/November 2005.

Lowe, Kimberly, Ph.D. 2005. Restoring forest roads. A Northern Arizona University Ecological Restoration Institute publication. Working Paper 12. June 2005.

Luce, C.H. and T. A. Black, 2001. Spatial and temporal patterns in erosion from forest roads. In Influence of Urban and Forest Land Uses on the Hydrologic-Geomorphic Responses of Watersheds, Edited by M.S. Wigmosta and S.J. Burges. Water Resources Monographs, American Geophysical Union. Washington D.C. pp. 165-178.

MacDonald, L. 2005. Sediment production and delivery from unpaved forest roads in the Sierra Nevada, California. Geophysical Research Abstracts, Vol. 7, 088831

MacDonald, L.H., Coe, D.B.R., 2008. Road sediment production and delivery: processes and management. In: Proceedings of the First World Landslide Forum, International Programme on Landslides and International Strategy for Disaster Reduction. United Nations University, Tokyo, Japan, pp. 381–384.

MacDondald, L.H., E.E. Wohl, S.W. Madsen. 1995. Validation of water yield thresholds on the Kootenai National Forest. Department of Earth Resources, Colorado State University. Fort Collins, CO.

MacDonald, L. 2005. Sediment production and delivery from unpaved forest roads in the Sierra Nevada, California. Geophysical Research Abstracts, Vol. 7, 088831.

Main, W. A., D. M. Paananen, and R. E. Burgan. 1990. FIREFAMILY 1988. St. Paul MN: U.S. Department of Agriculture, Forest Service, North Central Forest Experiment Station. General Technical Report NC-138.

Malecki, Ron. W. 2006. A new way to look at forest roads: the road hydrologic impact rating system (RHIR). The Road-RIPorter, Autumn Equinox. 2006. www.wildlandscpr.org

Mannan, A. L, E. H. Taliaferro and M. K. Little. 1996. Annual and diel harvest rates of leaf-cutter ants. Dartmouth Studies in Tropical Ecology p. 78 - 9.

Martin, Negin P. Ph.D. 2009. Monsanto's Roundup more deadly to liver cells than glyphosate alone. Organic Consumers Assn. August 18, 2009.

Maser, Chris, James M. Trappe, Steven P. Cline, Kermit Cromack Jr., Helmut Blaschke, James R. Sedell, and Frederick J. Swanson. 1984. USDA Forest Service, General Technical Report PNW-164. March 1984.

Maser, Chris, Robert F. Tarrant, James M. Trappe, and Jerry F. Franklin. 1988. From the forest to the sea: a story of fallen trees. General Technical Report PNW-GTR-229. 153 p.

McClelland, B. R. (1977). Relationships between hole-nesting birds, forest snags, and decay in western larch-douglas-fir forests of the northern Rocky Mountains.

McEllin, Shaun M. "Nest sites and population demographies of white-breasted and pigmy nuthatches in Colorado." *Condor* (1979): 348-352.

McGarigal, Kevin, Ph.D., William H. Romme, Ph.D., Michele Crist, Ph.D., and Ed Roworth, Ph.D. Cumulative effects of roads and logging on landscape structure in the San Juan Mountains, Colorado (USA). Landscape Ecology, Volume 16, Number 4/May 2001. www.springerlink.com

McGaughey, R. J. 2002. Creating Visual Simulations of Fuel Conditions Predicted by the Fire and Fuels Extension to the Forest Vegetation Simulator. USDA Forest Service. Rocky Mountain Research Station, RMRS-P-25.

McIntosh, Bruce A., James R. Sedell, Jeanette E. Smith, Robert C. Wissmar, Sharon E. Clarke, Gordon H. Reeves, and Lisa A. Brown. 1994. Management history of eastside ecosystems: changes in fish habitat over 50 years, 1935 to 1992. General Technial Report PNW-GTR-321. February 1994.

McKelvey, K.S., K.B. Aubry, and Y.K. Ortega. 2000. History and distribution of lynx in the contiguous United States. Pages 207-264 In Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, G.M. Koehler, C.J. Krebs, K.S. McKelvey, and J.R. Squires. (Tech. Eds.). Ecology and conservation of lynx in the United States. Univ. Press of Colorado. Boulder, CO. 480 pp.

McKenzie et al. (eds), The Landscape Ecology of Fire, Ecological Studies 213, DOI 10.1007/978-94-007-0301-8_3. Springer Science+Business Media B.V 2011, Chapter 3, Moritz et al., Native Fire Regimes and Landscape Resilience

McKinley, D.C., Michael G. Ryan, Richard A. Birdsey, Christian P. Giardina, Mark E. Harmon, Linda S. Heath, Richard A. Houghton, Robert B. Jackson, James F. Morrison, Brian C. Murray, Diane E. Pataki, and Kenneth E. Skog. 2011. A synthesis of current knowledge on forests and carbon storage in the United States. In press. Ecological Applications:

McLellan, Bruce N. 1990. Relationships between human industrial activity and grizzly bears. Bears; Their Biology and Management, Vol 8, International Conference on Bear Research and Management. February 1989 (1990), pp. 57-64.

McNab and Avers. 1994. Bailey's ecosections were used to summarize historic vegetation information. USDA. Forest Service

McNeel, J.F. and T.M. Ballard. 1992. Analysis of site stand impacts from thinning with a harvester-forwarder system. Journal of Forest Engineering (1992):23–29.

Meehan, W. (editor). 1991. Influences of Forest and Rangeland Management on Salmonid Fishes and Their Habitats. Road Construction and Maintenance Chapter 8 (pp. 297- 323). American Fisheries Society Special Publication 19. Bethesda, Maryland.

Megahan, W.F. 1980. Nonpoint source pollution from forestry activities in the western United States: Results of recent research and research needs. In US. Forestry and Water Quality: What Course in the 80s? An Analysis of Environmental and Economic Issues. Proceedings, 92-151. June 19-20, 1980, Richmond, VA. Washington, DC: Water Pollution Control Federation.

Megahan, Walter F. Ph.D. 2003. Predicting road surface erosion from forest roads in Washington state. From a presentation presented at the 2003 Geological society of America meeting. November 2-5, 2003. Gsa.confex.com

Mellen, T. Kim, E. Charles Meslow, and R. William Mannan. "Summertime home range and habitat use of pileated woodpeckers in western Oregon." *The Journal of wildlife management* (1992): 96-103.

Millar, C. I., N. L Stephenson and S. L. Stephens. 2007. Climate Change and Forest of the Future: Managing in the Face of Uncertainty. Ecological Applications, 17(8), 2007, pp. 2145-2151, Ecological Society of America.

Mindfully.org. Unknown date. Everything you never wanted to know about Monsanto's modus operandi (M.O.). http://www.mindfully.org/Pesticide/Monsanto-Roundup-Glyphosate.htm

Moench, Brian, MD. 2012. The autism epidemic and disappearing bees: a common denominator? Published in Truthout, April 21, 2012. http://truth-out.org/news/item/8586-the-autism-epidemic-and-disappearing-bees-a-common-denominator

Montgomery, David Ph.D. 1998. Statement at a Press Conference with Senator Robert Torricelli about S. 977 and HR 1376), the Act to Save America's Forests April 28, 1998, U.S. Capitol.

Morgan, Penelope, Emily K. Heyerdahl, and James P. Riser II. 2008. Multi-season climate synchronized historical fires in dry forests (1650-1900), northern Rockies, USA. Ecology, 89(3), 2008, pp. 705-716.

Moriarty, K. M., Zielinski, W. J., & Forsman, E. D. (2011). Decline in American marten occupancy rates at Sagehen Experimental Forest, California. *The Journal of Wildlife Management*, *75*(8), 1774-1787.

Morin, Herve. 2005. Roundup doesn't poison only weeds. 2005. Le Monde (France), March 12, 2005.

Moring, Dr. John R. 1975. The Alsea watershed study: effectsof logging on the aquatic resources of three headwater streams of the Alsea River, Oregon. Part III – discussion and recommendations. Fishery Research Report Number 9, Oregon Department of Fish and Wildlife, Corvallis, Oregon. December 1975.

Moser, Brian W. *Space use and ecology of goshawks in northern Idaho*. Vol. 68. No. 12. 2007.

Mother Jones Magazine. 2002. Fight fire with logging? Opinion piece.

Murray, B.C. 2008 Leakage from an avoided deforestation compensation policy: Concepts, empirical evidence, and corrective policy options. Nicholas Institute for Environmental Policy Solutions, Duke University, Durham, NC. 32p.

Nagorsen, D. W., and R. M. Brigham. 1993. Bats of British Columbia. University of British Columbia, Vancouver, B.C.

NatureServce 2012. Available: http://www.natureserve.org/explorer/servlet/NatureServe?init=Species.

http://www.natureserve.org/explorer/servlet/NatureServe?init=Species.

Natural Communities Magazine. 2009. Toxicity of glyphosate. July 16, 2009. http://naturalcommunitiesmag.com/2009/07/16/gm-soy-destroy-the-earth-and-humans-for-profit/.

Neary, D.G., K.C. Ryan, and L.F. DeBano, eds. 2008. Wildland fire in ecosystems: effects of fire on soils and water. Revised. Gen. Tech. Rep. RMRS-GTR-42-Vol.4. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. 250p.

Nelson, M. D., Johnson, D. H., Linkhart, B. D., & Miles, P. D. (2009). Flammulated owl (Otus flammeolus) breeding habitat abundance in ponderosa pine forests of the United States.

Nesser and others, 1997. Ecological Units of the Northern Region: Subsections (Veg) cover types to the settings, a map of potential vegetation types was used (Northern Region Cohesive Strategy Team, 2002 (veg)

Nez Perce Tribe. 1987. An Assessment of the Stream Habitat Conditions of Lower Clear Creek, Clearwater River Subbasin, Idaho. Technical Report 87-1. Nez Perce Tribe Department of Fisheries. Lapwai, ID.

Nielsen-Pincus, N. (2005). *Nest Site Selection, Nest Success, and Density of Selected Cavity-nesting Birds in Northeastern Oregon with a Method for Improving the Accuracy of Density Estimates* (Doctoral dissertation, University of Idaho).

NOAA. 1998. Matrix of Pathways and Indicators of Watershed Condition for Chinook, Steelhead, and Bull Trout, Local Adaptation for the Clearwater Basin and Lower Salmon. (Local adaptation of Making Endangered Species Act Determinations of Effect for Individual or Grouped Actions at the Watershed Scale, 1996).

NOAA. 2005. Memorandum for F/NWR4. Subject: Timber harvest and streamflow. Summary of literature review regarding timber harvest, roads, and water yield. Northwest Fisheries Science Center, Environmental Conservation Division. Seattle, WA.

NOAA. 2005. Final assessment of NOAA Fisheries' critical habitat analytical review teams for 12 evolutionarily significant units of West Coast Salmon and Steelhead. NOAA, Portland, OR.

Noble, Ian R. and Rodolfo Dirzo. 1997. Forests as human-dominated ecosystems. www.sciencemag.org, Science 25 July 1997: Volume 277 No. 5325 pp. 522-525.

Nussbaum, R.A., E.D. Brodie Jr, R.M. Storm. 1983. Amphibians and Reptiles of the Pacific NorthwestUniversity Press of Idaho, Moscow, Idaho

O'Farrell, Michael J., and Eugene H. Studier. "Myotis thysanodes." *Mammalian species* (1980): 1-5.

Olson, D. H., Anderson, P. D., Frissell, C. A., Welsh, H. H., & Bradford, D. F. (2007). Biodiversity management approaches for stream–riparian areas: perspectives for Pacific Northwest headwater forests, microclimates, and amphibians. *Forest Ecology and management*, *246*(1), 81-107.

O'Neill, Sadhbh. 2002. Roundup-Lymphoma connection. Hancockwatch.nfshost.com

Orme, M.L. and T.A. Leege. 1976. Emergence and survival of redstem (Ceanothus sanguineus) following prescribed burning. Tall Timbers Fire Ecology Conf. 14: 391-420.

Ott, R., A. Ambourn, F. Keirn, A, Arians. 2005. Relevant Literature for and Evaluation of the eEffectiveness of the Alaska Forest Resources and Practices Act: An Annotated Bibliography. Reference #404.

O'Toole, Randal. Undated. Incentives, not fuels, are the problem. www.ti.org.

O'Toole, Randal. 2002. An analysis of federal fire budgets and incentives. The Thoreau Institute. www.ti.org. July 2002.

O'Toole, Randal. 2002. Money to burn? Regulation. Winter 2002-2003.

Ortega, Yvette K. and Capen, David E. 1999. Effects of forest roads on habitat quality for ovenbirds in a forested landscape. Auk. 116(4):937-946.

Ott, R., A. Ambourn, F. Keirn, A, Arians. 2005 Relevant Literature for and Evaluation of the Effectiveness of the Alaska Forest Resources and Practices Act: An Annotated Bibliography. Reference #404. Alaska Dept. of Natural Resources, Division of Forestry, Anchorage, AK.

Paganelli, Alejandra, Victoria Gnazzo, Helena Acosta, Silvia L. Lopez, and Andres E. Carrasco. 2010. Glyphosate-based herbicides produce teratogenic effects on vertebrates by impairing retinoic acid signaling. Publicado por NOGAL DE VIDA, May 20, 2010.

Page-Dumroese D., Jurgensen M., Elliot W., Rice T., Nesser J., Collins T., and Meurisse R. 2000. Soil quality standards and guidelines for forest sustainability in northwestern North America. Forest Ecology Management 138(2000):445–462.

Page-Dumroese, D., M. Jurgensen, A. Abbot, T. Rice, J, Tirocke, S. Farley, and S. DeHart. 2006a. Monitoring changes in soil quality from post-fire logging in the Inland Northwest. Moscow, ID: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Forest Service Proceedings RMRS-P-41.

Page-Dumroese, D. S., M. F. Jurgensen, A.E. Tiarks, F. Ponder Jr., F.G. Sanchez, R.L. Fleming, J.M Kranabetter, R.F. Powers, D.M. Stone, J.D. Elioff, and D.A. Scott. 2006b. Soil physical property changes at the North American Long-Term Soil Productivity study sites: 1 and 5 years after compaction. Canadian Journal of Forest Research 36:551-564.

Page-Dumroese, D.S.; A.M. Abbott, T.M. Rice. 2009. USDA Forest Soil Disturbance Monitoring Protocol. Vols. 1 and 2. Moscow, ID: U.S. Department of Agriculture, Forest Service. FS-WO-82a,82b.

Pan UK 1998. Resistance to glyphosate. www.pan-uk.org

Partridge, Arthur, Ph.D., Stuart Pimm, Ph.D., Gary Meffe, Ph.D., David Montgomery, Ph.D., Seth Reice, Ph.D., and Henry Mushinsky, Ph.D. 1998. Press conference with Senator Robert Torricelli, April 28, 1998.

Patla, S. M. 1997. Nesting ecology and habitat of the northern goshawk in undisturbed and timber harvest areas on the Targhee National Forest, Greater Yellowstone Ecosystem. Thesis, Idaho State University, Idaho Falls, USA.

Peek, J.M., D.J. Pierce, D.C. Graham, and D.L. Davis. (1987). Moose Habitat Use and Implications for Forest Management in North-central Idaho. Proceedings – Second International Moose Symposium. Swedish Wildlife Research, Viltrevy, supplement 1, part one, 1987. pp. 195-199.

Perry, D.A., Hessburg, P.F., Skinner, C.N., Spies, T.A., Stephens, S.L., Taylor, A.H., Franklin, J.F., McComb, B., Riegel, G., 2011, The ecology of mixed severity fire regimes in Washington, Oregon, and Northern California. Forest Ecology and Management Journal, Elsevier.

Philpott, Tom 2010. Why Monsanto is paying farmers to spray its rivals' herbicides. Grist, October 20, 2010. http://www.grist.org/article/food-2010-10-20-why-monsanto-paying-farmers-to-spray-rival-herbicides/

Pierce, D.J. and J.M. Peek. 1984. Moose habitat use and selection patterns in north-central Idaho. J. Wildl. Manage. 48(4): 1335-1343.

Pimentel, David Ph.D. 2004. True integrated weed management: pesticides as a last resort. Excerpt from a Beyond Pesticides publication. 2004. http://www.beyondpesticides.org/infoservices/pesticidesandyou/Fall%2004/Montanas%20War%20On%20Weeds.pdf

Platt, Rutherford V, Thomas Veblen, and Rosemary Sheriff. 2006. Are wildfire mitigation and restoration of historic forest structure compatible? A spatial modeling assessment. Annals of the Association of American Geographers. Volume 96, Number 3, September 2006, pp. 455-470(16).

Portland Independent Media Center. 2009. Monsanto roundup (glyphosate) causes birth defects … in amphibian embryos, humans? Portland.indymedia.org

Potvin, F., Bélanger, L., & Lowell, K. (2000). Marten habitat selection in a clearcut boreal landscape. *Conservation Biology*, *14*(3), 844-857.

Powell, Douglas S, Joanne L. Faulkner, David R. Darr, Zhiliang Zhu, and Douglas W. MacCleery. 1992. Forest resources of the United States. Rocky Mountain Forest and Range Experiment Station. General Technical Report RM-234. 1992.

Powell, R.A. 1993. The fisher: life history, ecology, and behavior, second edition. University of Minnesota Press, Minneapolis, Minnesota, USA.

Power, Tom. The abuse of other people's hard times: the politics of forest fires. www.forwolves.org. August 15, 2000.

Powers, R.F. 1990. Are we maintaining the productivity of forest lands? Establishing guidelines through a network of long-term studies. In Proceedings: Management and Productivity of Western-Montane Forest Soils, 10–12 April 1990, Boise, Idaho. Compiled by A.E. Harvey, L.F. Neuenschwander, and I.D. Boise.USDA For. Serv. Gen. Tech. Rep. INT-GTR-280. pp. 70–89.

Powers, R.P., D. A. Scott, F.G. Sanchez, R.A. Voldseth, Page-Dumroese, D.S., J.D. Elioff, and D.M. Stone. 2005. The North American long-term soil productivity experiment: Findings from the first decade of research. Forest Ecology and Management 220:31-50.

Powers, L.R., A. Dale, P.A. Gaede, C. Rodes, L. Nelson, J.J. Dean, and J.D. May. 1996. Nesting and food habits of the flammulated owl (Otus flammeolus) in southcentral Idaho. J. Raptor Res. 30(1):15-20.

Prasad, Sahdeo, Ph.D., Smite Srivastava Ph.D., Madhulika Singh Ph.D. and Yogeshwer Shukla Ph.D. 2009. Clastogenic effects of glyphosate in bone marrow cells of swiss albino mice. Journal of Toxicology, Volume 2009, Article ID 308985, 6 pages.

Rachel's Hazardous Waste News #400. 1994. EPA Investigates Monsanto.

Raley, C.M, E.C. Lofroth, R.L. Truex, J.S. Yaeger, and J.M. Higley. 2012. Habitat ecology of fishers in western North America: a new synthesis. K.B. Aubry, W.J. Zielinski, M.G. Raphael, G. Proulx, S.W. Buskirk (Eds.), Biology and Conservation of Martens, Sables, and Fishers: A New Synthesis, Cornell University Press, Ithaca, New York (2012), pp. 231–254

Raphael, Martin G., and Marshall White. "Use of snags by cavity-nesting birds in the Sierra Nevada." *Wildlife monographs* (1984): 3-66.

Raven, Dr. Peter, Jane Goodall, C.B.D, Ph.D., and Edward O. Wilson, Ph.D. 1998. Letter to Congress urging passage of the Act to Save America's Forests. www. saveamericasforests.org

Raven, Peter H. 2001.Letter to Senator Jean Carnahan in support of the Act to Save America’s Forests. www.saveamericasforests.org

Rayne, S., G. Henderson, P.Gill, K.Forest. 2008. Riparian Forest Harvesting Effects on Maximum Water Temperatures in Wetland-sourced Headwater Streams from the Nicola River Watershed, British Columbia, Canada. Water Resour Manage (2008) 22:565–578.

Reed, R. A., Johnson-Barnard, J., and Baker, W. A. 1996. Contribution of roads to forest fragmentation in the Rocky Mountains. Conservation Biology 10:1098-1106.

Reeves, D., D. Page-Dumroese, and M. Coleman. 2011. Detrimental soil disturbance associated with timber harvest systems on National Forests in the Northern Region. Fort Collins, CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. Research Paper RMRS-RP-89.

Reid, L. M., Ph.D., and T. Dunne. 1984. Sediment production from forest road surfaces. Water Resour. Res. 20(11), 1753-1761.

Reid, Leslie M., Ph.D., Zeimer, Robert R., Ph. D., and Furniss, Michael J. 1994. What do we know about roads? USDA Forest Service.

Reinhardt, E., and N. L. Crookston. (Technical Editors). 2003. The fire and fuels extension to the forest vegetation simulator. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.General Technical Report RMRS-GTR-116.

Reinhardt, Elizabeth D, Robert E. Keane, David E. Calkin, and Jack D. Cohen. 2008. Objectives and considerations for wildland fuel treatment in forested ecosystems of the interior western United States. Published in Forest Ecology and Management.

Relya, Rick Ph.D. 2005. Roundup is highly lethal. Dr. Relya responds to Monsanto’s concerns regarding recent published study. Mindfully.org, April 1, 2005. http://www.mindfully.org/GE/2005/Relyea-Monsanto-Roundup1apr05.htm

Relyea, Rick A. Ph.D., Nancy Schoeppner and Jason T. Hoverman. 2005. Pesticides and amphibians: the importance of community contest. Ecological Applications, 15(4), July 1, 2005, pp. 1125-1134.

Relyea, R.A. Ph.D. 2005. The impact of herbicides on the biodiversity and productivity of aquatic communities. Ecological Applications v 15, n. 2, Arpil 1, 2005.

Relyea, R. A. Ph.D. 2005. The lethal impacts of roundup and predatory stress on six species of north American tadpoles. Archives of Environmental Contamination and Toxicology v 48, n. 3, April 1, 2005.

Reuters. 2001. Columbian court suspends aerial spraying of roundup on drug crops. Republished by Mindfully.org. July 27, 2001. http://www.mindfully.org/Pesticide/Roundup-Drug-Spray-Colombia.htm

Reynolds, R. T., S. M. Joy, and D. G. Leslie. "Nest productivity, fidelity, and spacing of northern goshawks in Arizona." *Studies in Avian Biology* 16 (1994): 106-113.

Rice, Raymond M. Ph.d., Forest B. Tilley and Patricia A. Datzman. 1979. Watershed's response to logging and roads: South Fork of Caspar Cree, California, 1967-1976. USDA Forest Service, Research Paper PSW-146.

Riedel, Mark S. Ph.D. and James M. Vose Ph.D. 2002. Forest road erosion, sediment transport and model validationin the southern Appalachians. Presented at the second federal interagency hydrologic modeling conference, July 28-August 1, 2002.

Rieman B.E., Isaak, D., Adams, S., Horan, D., Nagel, D., Luce, C., and Myers, D. 2007. Anticipated climate warming effects on bull trout habitats and populations across the interior Columbia River basin, Transactions of the American Fisheries Society, 136:6, 1552-1565, DOI: 10.1577/T07-028.1

Rippy, R. C.; J.E.Stewart,P.J. Zambino, N.B. Klopfenstein, J.M. Tirocke, M. Kim, and W. G. Thies. 2005. Root diseases in coniferous forests of the Inland West: potential implications of fuels treatments. Gen. Tech. Rep. RMRS-GTR-141. Fort Collins, CO: USDA Forest Service, Rocky Mountain Research Station.

Roberson, Emily B, Ph.D. 2002. Letter to Dale N. Bosworth, Chief, USD Forest Service. August 12, 2002.

Romin, S.J. and W.R. Bosworth. 2010. Northern region bat species occurrences in Idaho. Idaho Dept. of Fish and Game. Boise, ID. 65p.

Roseboro, Ken. 2010. Monsanto's glyphosate problems: scientist warns of dire consequences with widespread use. The Organic and Non-GMO Report, posted June 14, 2010. http://www.organicconsumers.org/articles/article_21039.cfm

Rosenberg, K.V. 2004. Partners in flight continental priroities and objectives defined at the state and bird conservation region levels, Idaho. Cornell Lab of Ornithology. Ithaca, NY. 30p.

Rosgen, D. and H. L. Silvey. 1996. Applied River Morphology. Wildland Hydrology, Pagosa Springs, Colorado.

Rossol, Monona. 2011. Say what? A chemical can damage your lungs, liver and kidneys and still be labeled non-toxic? 2011. May 9, 2011. http://www.alternet.org/story/150888/say_what_a_chemical_can_damage_your_lungs%2C_liver_and_kidneys_and_still_be_labeled_%22non-toxic%22?page=entire

Rowland, M. M., M. J. Wisdon, B. K. Johnson, and M. A. Penninger. 2005. Effects of roads on elk: implications for management in forested ecosystems. Pages 42-52 in Wisdom, M. J. technical editor, *The Starkey Project: a synthesis of long-term studies of elk and mule deer*. Reprinted from the 2004 Transactions of the North American Wildlife and Natural Resources Conference Alliance Communications Group.

Rowland, M.M., M.J. Wisdom, B.K. Johnson, and J.G. Kie. 2000. Elk distribution and modeling in relation to roads. J. Wldlf. Mgmt. 64(3):672-684.

Ruediger, B., J. Claar, S. Gniadek, B. Holt, L. Lewis, S. Mighton, B. Naney, G. Patton, T. Rinaldi, J. Trick, A. Vandehey, F. Wahl, N. Warren, D. Wenger, and A. Williamson. 2000. Canada Lynx conservation assessment and strategy, 2nd edition. USDA FS, USDI FWS, USDI BLM, and USDI NPS. Forest Service Pub. #R1-00-53, Missoula, MT. 142 pp.

Ruggiero, L.F., K.B. Aubry, S.W. Buskirk, L.J. Lyon and W.J. Zielinski (tech. eds.). 1994. The Scientific basis for conserving forest carnivores: American marten, fisher, lynx and wolverine in the western United States. General Technical Report RM-GTR-254. USDA Forest Service, Rocky Mountain Forest and Range Experiment Station, Fort Collins, CO. 184 pp.

Running, Steven W. 2006. Is global warming causing more, larger wildfires? In Science 313, 927.

Ryan M.G., M.E. Harmon, R.A. Birdsey, C.P. Giardina, L.S. Heath, R.A. Houghton, R.B. Jackson, D.C. McKinley, J.F. Morrison, B.C. Murray, D.E. Pataki, and K.E. Skog. 2010. A Synthesis of the Science on Forests and Carbon for U.S. Forests. Issues in Ecology, Report Number 13. 17 p.

Saab, V.A., J.Dudley, and W.L. Thompson. 2004. Factors influencing occupancy of nest cavities in recently burned forests. The Condor 106:20-36.

Samson, F. B. 2005 (as amended, March 5, 2006). Conservation Assessment for the northern goshawk, black-backed woodpecker, flammulated owl, and pileated woodpecker. Unpublished mimeo, USDA Forest Service Northern Region, Missoula, Montana, USA.

Samson, F.B. 2006. Habitat estimates for maintaining viable populations of the northern goshawk, black-backed woodpecker, flammulated owl, pileated woodpecker, American marten and fisher. Unpublished report. USDA Forest Service, Northern Region, Missoula, MT.

Sanchez, F.G., A.E. Tiarks, J.M. Kranabetter, D.S. Page-Dumroese, R.F. Powers, P.T. Sanborn, and W.K. Chapman. 2006. Effects of organic matter removal and soil compaction on fifth-year mineral soil carbon and nitrogen contents for sites across the United States and Canadian Journal of Forest Research 36:565–576.

Sanders, T. and Addo, J. 1993. Effectiveness and Environmental Impact of Road Dust Suppressants. Department of Civil Engineering, Colorado State University. Ft. Collins, CO.

Sauder, J.D, and J. L. Rachlow. 2015. Forest heterogeneity influences habitat selection by fishers (*Pekania pennanti*) within home ranges. For. Ecol. & Mgmt. 347:49-56.

Sauder, J.D, and J. L. Rachlow. 2014. Both forest composition and configuration influence landscape-scale habitat selection by fishers (Pekania pennanti) in mixed coniferous forests of the Northern Rocky Mountains. For. Ecol. & Mgmt. 314: 75-84.

Sauer, J. R., J. E. Hines, J. E. Fallon, K. L. Pardieck, D. J. Ziolkowski, Jr., and W. A. Link. 2011. The North American Breeding Bird Survey, Results and Analysis 1966 - 2010. Version 12.07.2011 USGS Patuxent Wildlife Research Center, Laurel, MD.

Schafer, Kristin. 2012. Low doses matter hugely, say scientists. www.panna.org

Schmidt, K. M., J. P. Menakis, C. C. Hardy, W. J. Hann, and D. L. Bunnell. 2002. Development of coarse scale spatial data for wildland fire and fuel management. Fort Collins Co: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-87.

Schnackenberg, E.S., MacDonald, L.H. 1998. Detecting cumulative effects on headwater streams in the Routt National Forest, Colorado. Journal of the American Water Resources Association. Vol. 34. No. 5.

Schwartz, Chuck Ph.D. 1998. Wildlife and roads. The Interagency Forest Ecology Team (INFEST) newsletter, March 1998.

Schoennagel, Tania, Thomas T. Veblen, and William H. Romme. The interaction of fire, fuels, and climate across Rocky Mountain forests. Bioscience, July 2004, Vol. 54 No. 7.Schoennagle, Tania, Cara R. Nelson, David M. Theobald, Gunnar C. Carnwrath, and Teresa B. Chapman. 2009. Implementation of national fire plan treatments near the wildland-urban interface in the western United States. From proceedings of the National Academy of Sciences, May 1, 2009.

Science Centric. 2009. Forest fire prevention efforts will lessen carbon sequestration, add to greenhouse warming. www.sciencecentric.com. July 9, 2009.

Scott, Mark G. 2001. Forest clearing in the Gray's Rier watershed 1905-1996. www.markscott.biz

Scott, J. H., and R. E. Burgan. 2005. Standard fire behavior fuel models: A comprehensive set for use with Rothermel's surface fire spread model. Fort Collins CO: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station. General Technical Report RMRS-GTR-153.

Seralini, Gilles-Eric. 2006. Issue: cumulative impacts to amphibian species. www.signaloflove.org.

Servheen, G., S. Blair, D. Davis, M. Gratson, K. Leidenfrost, B. Stotts, J. White, and J. Bell. 1997. Interagency guidelines for managing elk habitat and populations on U.S. Forest Service lands in central Idaho. 97pp.

Shaman, J. and M. Stieglitz, D. Burns. 2004. Are big basins just the sum of small catchments? Hydrological Processes 18:3195-3206.

Shields, Deborah J., Ingrid M. Martin, Wade E. Martin, and Michelle A. Haefele. 2002. Survey results of the American public's values, objectives, beliefs, and attitudes regarding forests and grasslands: a technical document supporting the 2000 USDA Forest Service RPA Assessment. Gen. Tech. Rep. RMRS-GTR-95. Fort Collins, Colorado, USDA, Forest Service, Rocky Mountain Research Station.

Shanley, James B. and Beverley Wemple, Ph.D. 2002. Water quantity and quality in the mountain environment. Vermont Law Review, Vol. 26:717.

Short, C. Brant and Dayle C. Hardy-Short. 2003. Physicians of the forest: a rhetorical critique of the Bush healthy forest initiative. Electronic Green Journal.

Sierra Club. 2005. Ending commercial logging on public lands (ECL). Northcarolina.sierraclub.org. April 24, 2005.

Singh, V. P. 1997. Effect of spatial and temporal variability in rainfall and watershed characteristics on stream flow hydrograph. Hydrological Processes 11(12):1649-1669.

Slaymaker, Olav. 2000. Assessment of the geomorphic impacts of forestry in British Columbia. AMBIO: A Journal of the Human Environment, 29(7):381-387, 2000. www.bioone.org

Smith, Jeffery. 2010. Genetically modified soy diets lead and uterus changes in rats. Foodconsumer.org, September 22, 2010. http://www.foodconsumer.org/newsite/Safety/gmo/genetically_modified_soy_diets_0910100128.html

Smith, Jeffery. 2010. Genetically modified soy linked to sterility, infant mortality. Foodconsumer.org, September 22, 2010. http://www.foodconsumer.org/newsite/Watch-List/genetically_modified_soy_linked_to_sterility_infant_mortality_22.html

Smith, K (District Fisheries Biologist). Personal observations of PACFISH buffers post-harvest and post-site preparation (slash burning) on Clearwater National Forest timber sales from 2000 through 2011. Also conducted culvert monitoring effort on Fan Creek on the Lochsa District.

Smithwick, et al. 2002. Potential Upper Bounds of Carbon Stores in Forests of the Pacific Northwest.

Squires, J.R., N.J. DeCesare, L.E. Olson, J.A. Kolbe, M. Hebblewhite and S.A. Parks. 2013. Combining resource selection and movement behavior to predict corridors for Canada lynx at their southern range periphery. Bio. Cons. 157: 187-95.

Squires, J.R., N.J. DeCesare, J.A. Kolbe, and L.R. Ruggiero. 2010. Seasonal Resource Selection of Canada Lynx in Managed Forests of the Northern Rocky Mountains. J. of Wild. Mgmt. 74(8) p.1648-1660.

Squires, J. R., and P. L. Kennedy. 2006. Northern goshawk ecology: an assessment of current knowledge and information needs for conservation management. Studies in Avian Biology 31: 8-62.

Sridhar, V., Sansone A.L., LaMarche, J., Dubin, T. and Lettenmaier, D.P. 2004. Prediction of Stream Temperatures in Forested Watersheds. Journal of the American Water Resources Association (JAWRA), 40(1):197-213.

Stahl, Andy. 2003. Testimony before the House Resources Committee. www.propertyrightsresearch.org. August 25, 2003.

Stednick, J.D. 1995 Monitoring the effects of timber harvest on annual water yield. J. Hydrology, 176:79-95Stickney, P. F. 1980. Data base for post-fire succession, first 6 to 9 years, in Montana larch-fir forests. U.S. For. Serv. Gen. Tech. Rep. INT- 62. 133pp.

Stickney, Alice A. *Subsistence Resource Utilization: Nikolai and Telida. Interim Report II*. Alaska Department of Fish and Game, Division of Subsistence, 1981.

Storm, R. M., and W. P. Leonard. 1995. Reptiles of Oregon and Washington. Seattle Audubon Society, Seattle, WA.

Stowell, F., A.Espinosa, T.C. Bjornn, W.S. Platts, D.C. Burns, and J.S. Irving. 1983. Guide for Predicting Salmonid Response to Sediment Yields in Idaho Batholith Streams. USDA Forest Service, Northern and Intermountain Regions.

Stowell R., 1986. Forest Plan Resource Documentation Report. Nez Perce National Forest, Grangeville, ID.

Strickler, Karyn and Timothy G. Hermach. 2003. Liar, liar, forests on fire: why forest management exacerbates loss of lives and property. www.commondreams.org. October 31, 2003.

Sugden, Brian, R. Ehtridge, G. Mathieus, P. Heffernan, G. Frank and G. Sanders. 2012 Montana's Forestry Best Management Practices Program: 20 Years of continuous improvement. Journal of Forestry 110(6): 328-336

Swift, L.W. Jr. and R.G. Burns. 1999. The three R's of roads: redesign, reconstruction, and restoration. Journal of Forestry 97(8):41-44.

Swift Jr., L. W. 1984. Soil losses from roadbeds and cut and fill slopes in the southern Appalchian Mountains. Southern Journal of Applied Forestry 8: 209-216.

Switalski, Adam. 2003. Where have all the songbirds gone? Roads, fragmentation, and the decline of Neotropical migratory songbirds. Wildlands CPR, September 8, 2003.

Switalski, T. A., J. A. Bissonette, T. H. DeLuca, C.H. Luce, and M.A. Madej. 2004. Benefits and impacts of road removal. Frontiers in Ecology and Environment 2(1):21-28.

Takken, I., Croke, J., and Lane, P.2008 A methodology to assess the delivery of road runoff in forestry environments. Hydrological Processes, 22: 254-264.Taylor, P. J. "Echolocation calls of twenty southern African bat species." *South African Journal of Zoology* 34.3 (1999): 114-124.

Tepp, J. S. 2002. Assessing visual soil disturbance on eight commercially thinned sites in northeastern Washington. Portland, OR: U.S. Department of Agriculture, Forest Service, Pacific Northwest Research Station. Research Note PNW-RN-535.

The Wild Ones. 2006. Herbicide myths vs. the facts. www.for-wild.org

Thomas, Craig. 2007. Living with risk: homeowners face the responsibility and challenge of developing defenses against wildfires. Opinion. www.sierraforestlegacy.org. July 1, 2007.

Thomas, J. W., Anderson, R. G., Maser, C., & Bull, E. L. (1979). Snags. *Wildlife habitats in managed forests–the Blue Mountains of Oregon and Washington. Agricultural Handbook*, *553*, 60-77.

Trigona, Marie. 2009. Study released in Argentina puts glyphosate under fire. Znet. July 28, 2009.

Troendle, C. A. and R.M. King. 1987. The effects of partial and clearcutting on streamflow at Deadhorse Creek, Colorado. Journal of Hydrology 90:145-157.

Troendle, C.A., L.H. MacDonald, C.H. Luce, I.J. Larsen. 2009. Cumulative Watershed Effects of Fuel Management in the Western United States. USDA Forest Service RMRS-GTR-231.

Trombulak, Stephen C. Ph.D. and Christopher A. Frissell Ph.D. 2000. Review of ecological effects of roads on terrestrial and aquatic communities. Conservation Biology, volume 14, No. 1, Pages 18-30, February 2000.

Ulizio, T., J. Squires, and J. Claar. 2007. Nez Perce national forest 2007 lynx surveys, final report. USDA Forest Service, R1, RMRS. Missoula, MT. 5pp.

University of Arizona. 2006. More large forest fires linked to climate change. ScienceDaily. July 10, 2006.

Unsworth, J. W., Kuck, L., Garton, E. O., & Butterfield, B. R. (1998). Elk habitat selection on the Clearwater national forest, Idaho. *The Journal of wildlife management*, 1255-1263.

Unsworth, J. W., Kuck, L., Scott, M. D., & Garton, E. O. (1993). Elk mortality in the Clearwater drainage of northcentral Idaho. *The Journal of wildlife management*, 495-502.

USDA Forest Service. 1973. Forest Hydrology Part II – Hydrologic effects of vegetation manipulation. USDA Forest Service, Missoula, Montana.

USDA Forest Service. 1974. National Forest Landscape Management, Volume 2, Chapter: The Visual Management System. Agric. Handbook. 462. Washington, D.C.: U.S. Department of Agriculture, Forest Service. 47 p.

USDA Forest Service. 1981. R1/R4 Guide for Predicting Sediment Yields from Forested Watersheds. Northern and Intermountain Regions.

USDA Forest Service. 1987a. Nez Perce National Forest Plan, as amended. Grangeville, ID: U.S. Department of Agriculture, Forest Service, Nez Perce National Forest.

USDA Forest Service. 1987b. Nez Perce National Forest Plan final environmental impact statement and record of decision. Grangeville, ID: U.S. Department of Agriculture, Forest Service, Nez Perce National Forest.

USDA Forest Service. 1988a. Stream habitat surveys- Clear Creek, Kay Creek, South Fork Clear Creek, West Branch Creek, Hoodoo Creek, West Fork Clear Creek, Lost Mule Creek. Clearwater Ranger District, Nez Perce National Forest. Grangeville, ID.

USDA Forest Service. 1988b. Forest Service Handbook of Water and Soil Conservation Practices. FSH 2509.22. R1/R4Amendment 1.

USDA Forest Service. 1992. Moose/Pacific Yew Conservation Guidelines.

USDA Forest Service. 1993. Stream habitat surveys- Middle Fork Clear Creek, Solo Creek, Pine Knob Creek. Selway Ranger District, Nez Perce National Forest. Grangeville, ID.

USDA Forest Service. 1995. Landscape aesthetics: A handbook for scenery management. Agric. Handbook. 701. Washington, D.C.: U.S. Department of Agriculture, Forest Service, 246 p.

USDA Forest Service. 1997. Upper Columbia River Basin Draft Environmental Impact Statement: Volume 1. USDA Forest Service, Pacific Northwest Research Station; USDI Bureau of Land Management.

USDA Forest Service, 1998a, Northern Region Overview- Detailed Report.

USDA Forest Service. 1998b. Fisher.

USDA Forest Service, 2000. Successional Functions of Pathogens and Insects for Ecoregion Sections M332a and M333d in Northern Idaho and Western Montana- Volume 2-Results and Conclusions. Forest Service, State and Private Forestry, Forest Health Protection, Northern Region, FHP Report No. 00-11, July 2000.

USDA Forest Service. 2001. Selway and Middle Fork Clearwater River Sub Basin Assessment. Volumes 1 and 2. Nez Perce National Forest. Grangeville ID.

USDA Forest Service. 2003 FY 2003 Monitoring and evaluation report. Clearwater National Forest, Orofino, ID: U.S. Department of Agriculture, Forest Service.

USDA Forest Service. 2006a. Bald angel vegetation management project environmental assessment. La Grande Ranger District, Wallow-Whitman National Forest. December 2006.

USDA Forest Service. 2006b. Forest plan evaluation and monitoring report. Fiscal year 2006. Hamilton, MT: U.S. Department of Agriculture, Forest Service, Bitterroot National Forest.

USDA Forest Service. 2007a. Proposed Land Management Plan Nez Perce National Forest. Grangeville, ID.

USDA Forest Service. 2007b. Final Environmental Impact Statement Northern Rockies lynx management direction.

USDA Forest Service. 2007c. Northern Rockies lynx management direction Record of Decision.

USDA Forest Service 2007d. Black-backed Woodpecker.

USDA Forest Service 2008. 36 CFR Part 294; Special Areas; Roadless Area Conservation; Applicability to the National Forests in Idaho; Final Rule.

USDA Forest Service, 2009a. PACFISH INFISH Biological Opinion Effectiveness Monitoring Program for Streams and Riparian Areas, 2009 Summary Report. http://www.fs.fed.us/biology/resources/pubs/feu/pibo/2009_pibo_em_annual_report_final.pdf

USDA Forest Service. 2009b. Clearwater National Forest annual monitoring & evaluation report: Fiscal year 2009. Orofino, ID: U.S. Department of Agriculture, Forest Service, Clearwater National Forest.

USDA Forest Service, 2011a. An Implementation Guide to the Fish/Water Quality Objectives of the Nez Perce National Forest Plan. Nez Perce National Forest. Grangeville, Idaho.

USDA Forest Service. 2011b. South Fork-West Fork Clear Creek road decommissioning project environmental assessment. Grangeville, ID: Nez Perce National Forest.

USDA Forest Service. 2011c. South Fork-West Fork Clear Creek road decommissioning project decision notice and finding of no significant impact. Grangeville, ID: Nez Perce National Forest.

USDA Forest Service. 2013. Clear creek integrated restoration project- DEIS. Kamiah, Idaho. pp 263.

USDA Forest Service. 2014. Forest Service Manual. FSM 2500 - Watershed and Air Management. R1 Supplement No. 2500-14-1. Missoula, Montana.USDA Forest Service, 2014. PACFISH Buffer and Temporary Road Monitoring, Lochsa Ranger District, unpublished data.

USDA Forest Service and USDI Bureau of Land Management. 1995. Interim Strategies for Managing Anadromous Fish-producing Watersheds in Eastern Oregon and Washington, Idaho, and Portions of California (PACFISH). Washington, D.C.

USDA Forest Service, Clearwater National Forest. 1988 through 2009. Clearwater National Forest annual monitoring and evaluation reports. Orofino, Idaho.

USDA Forest Service, Nez Perce National Forest. 2011. South Fork/West Fork Clear Creek Road Decommissioning Environmental Assessment.

USDA Natural Resources Conservation Service (NRCS). 2006. Soil survey of the Nez Perce National Forest area, Idaho. Washington, DC: U.S. Department of Agriculture, NRCS.

USDI and USDA 2001. A Collaborative Approach for Reducing Wildland Fire Risks to Communities and the Environment 10-Year Comprehensive Strategy. Available online at www.fireplan.gov.

USDI Fish and Wildlife Service. 1987. Northern Rocky Mountain Wolf Recovery Plan. Denver, CO. 119pp.

USDI Fish and Wildlife Service. 1998. Goshawk.

USDI Fish and Wildlife Service. 2000. Endangered and threatened wildlife and plants; determination of threatened status for the contiguous U.S. distinct population segment of the Canada lynx and related rule. FR v65, n58, p. 16052-16086.

USDI, Fish and Wildlife Service. 2005. Recovery Outline: contiguous United States distinct population segment of the Canada lynx. USFWS. Montana Field Office, Helena, MT. 21pp.

USDI Fish and Wildlife Service. 2006. Endangered and threatened wildlife and plants; designation of critical habitat for the contiguous United States distinct population segment of the Canada lynx. FR v71, n217, p. 66008-66061.

USDI Fish and Wildlife Service. 2007. Biological opinion on the Northern Rocky Mountains Lynx Amendment.

USDI Fish and Wildlife Service. 2009. Endangered and threatened wildlife and plants; revised designation of critical habitat for the contiguous United States distinct population segment of the Canada lynx. FR v74, n36, p. 8616-8702.

USDI Fish and Wildlife Service. 2010. Endangered and threatened wildlife and plants; 12-month finding on a petition to list the North American wolverine as endangered or threatened. FR v75, n239, p. 78030-78061.

USDI Fish and Wildlife Service. 2012. Systematic Fishway Survey and Evaluation for Upstream Passage of Adult Pacific Lamprey at the FCRPS Projects in the Mainstem Columbia and Snake Rivers. Columbia River Fisheries Program Office. Vancouver. WA.

USDI Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; Threatened status for the distinct population segment of the north American wolverine occurring in the contiguous United States; establishment of a nonessential experimental population of the north American wolverine in Colorado, Wyoming, and New Mexico. Proposed Rules. FR v78, n23, p. 7863-7890.

USDI Fish and Wildlife Service. 2013. Endangered and threatened wildlife and plants; revised designation of critical habitat for the contiguous U.S. distinct population segment of the Canada lynx and revised distinct population segment boundary. FR v78, n187, p. 59429-59474.

U.S. Environmental Protection Agency. 2003. EPA Region 10 Guidance for Pacific NorthwestState and Tribal Temperature Water Quality Standards. EPA 910-B-03-002. Region 10 Officeof Water, Seattle, WAUS EPA. 2010. Inventory of US Greenhouse Gas Emissions and Sinks: 1990-2008. Executive Summary. Prepared by the United Staes Environmental protection Agency. April 2010. [24 pp. cited pp. 7-14].

US EPA. 1993. R.E.D. Facts glyphosate. EPA-738-F-93-011 September 1993.

Valente, Marcela. 2009. Health-Argentina: scientists reveal effects of glyphosate. www.ipsnews.net

Vincent, James W. PhD., Daniel A. Hagen, Ph.D., Patrick G. Welle, Ph.D., and Kole Swanser. 1995. Passive-use values of public forestlands: a survey of the literature. A study conducted on behalf of the U.S. Forest Service. www.icbemp.gov

Vinje, Eric. Date Unknown. Chemical quandary: the problem with pesticides, herbicides, and chemical fertilizer. Planet Natural. http://www.planetnatural.com/site/garden-chemicals.html

Voss, Rene. 2002. Logging industry misrepresents environmentalists' role in forest fires. Opinion. www.baltimorechronicle.com.

Warner, M., and Czaplewski, N.J. 1984. Myotis volans. Mamm. Species No. 224. pp. 1-4.

Warren, N (editor). 1990. Old-growth habitat and associated wildlife species in the Northern Rocky Mountains. Northern Region Wildlife Habitat Relationships Program. R1-90-42. 47 pp.

Waters, T. F. 1995. Sediment In Streams. Sources, Biological Effects and Control. American Fisheries Society Monograph 7. American Fisheries Society, Bethesda, MD.

Wear, D.N., and B.C. Murray, 2004. Federal timber restrictions, interregional spillovers, and the impact on US softwood markets. Journal of Environmental Economics and Management Volume 47, Issue 2, March 2004, Pages 307-330.

Weber, Jude and Hal Weitzman. 2009. Argentina pressed to ban crop chemical. The Financial Times, UK, May 29, 2009.

Weir, R. D., and A. S. Harestead. 2003. Scale-dependent habitat selectivity by fishers in South-Central British Columbia. Journal of Wildlife Management **67**:73–82.

Westerling, A.L. and B.P. Bryant. 2008. Climate change and wildfire in California. Climatic Change: 87(Suppl. 1): S231-S249.

Westerling, Anthony. 2006. Does global warming increase forest fires? Talk of the Nation. www.npr.org. July 7, 2006.

Western Bat Working Group. 1998. Online Access.

Whitman, Maryann. 2006. The roundup myth. Opinion.

Wickipedia. 2013. 2,4-Dichlorophenosyacetic acid.

Wisdom, M. J., R. S. Holthausen, D. C. Lee, B. C. Wales, W. J. Murphy, M. R. Eames, C. D. Hargis, V. A. Saab, T. D. Rich, F. B. Samson, D. A. Newhouse and N. Warren. (2000). Source habitats for terrestrial vertebrates of focus in the Interior Columbia Basin: Broadscale trends and management implications. U.S. Department Agric., For. Serv., Pacific Northwest Res. Stat. Gen. Tech. Rep. PNW-GTR-485, Portland.

Wright, Bronwen. 2009. Excerpt from a May 11, 2009 letter to the Rogue River-Siskiyou National Forest Travel Management Team.

Wright, V., S. Hejl, and R.L. Hutto. 1997. Conservation implications of a multi-scale study of flammulated owl (OTUS FLAMMEOLUS) habitat use in the northern Rocky Mountains, USA. Pages 506-516 in J. R. Duncan, D. H. Johnson, and T. H. Nicholls, editors. Biology and conservation of owls in the Northern Hemisphere. USDA Forest Service General Technical Report, GTR NC-190, St. Paul, MN

Wuerthner, George. 2007. The climate factor; forest thinning won't deter the coming large fires. Opinion. www.eugeneweekly.com. December 6, 2007.

Wuerthner, George. 2008. Logging, thinning would not curtail wildfires. Opinion. Wuerthner.blogspot.com.

Wuerthner, George. 2008. Ecological differences between logging and wildfire. Opinion. Wuerthner.blogspot.com.

Wuerthner, George. 2009. Who will speak for the forests? Opinion. Newest.net. January 27, 2009.

Wuerthner, George. 2010. Forest Service misses education opportunity. Opinion. Newest.net. June 18, 2010.

Wuerthner, George. 2010. Pine beetle fears misplaced. Opinion. Helenair.com. March 25,2010.

Younk, J. V. and M. J. Bechard. 1994. Breeding ecology of the northern goshawk in high-elevation aspen forests of northern Nevada. Studies in Avian Biology 16:119-121.

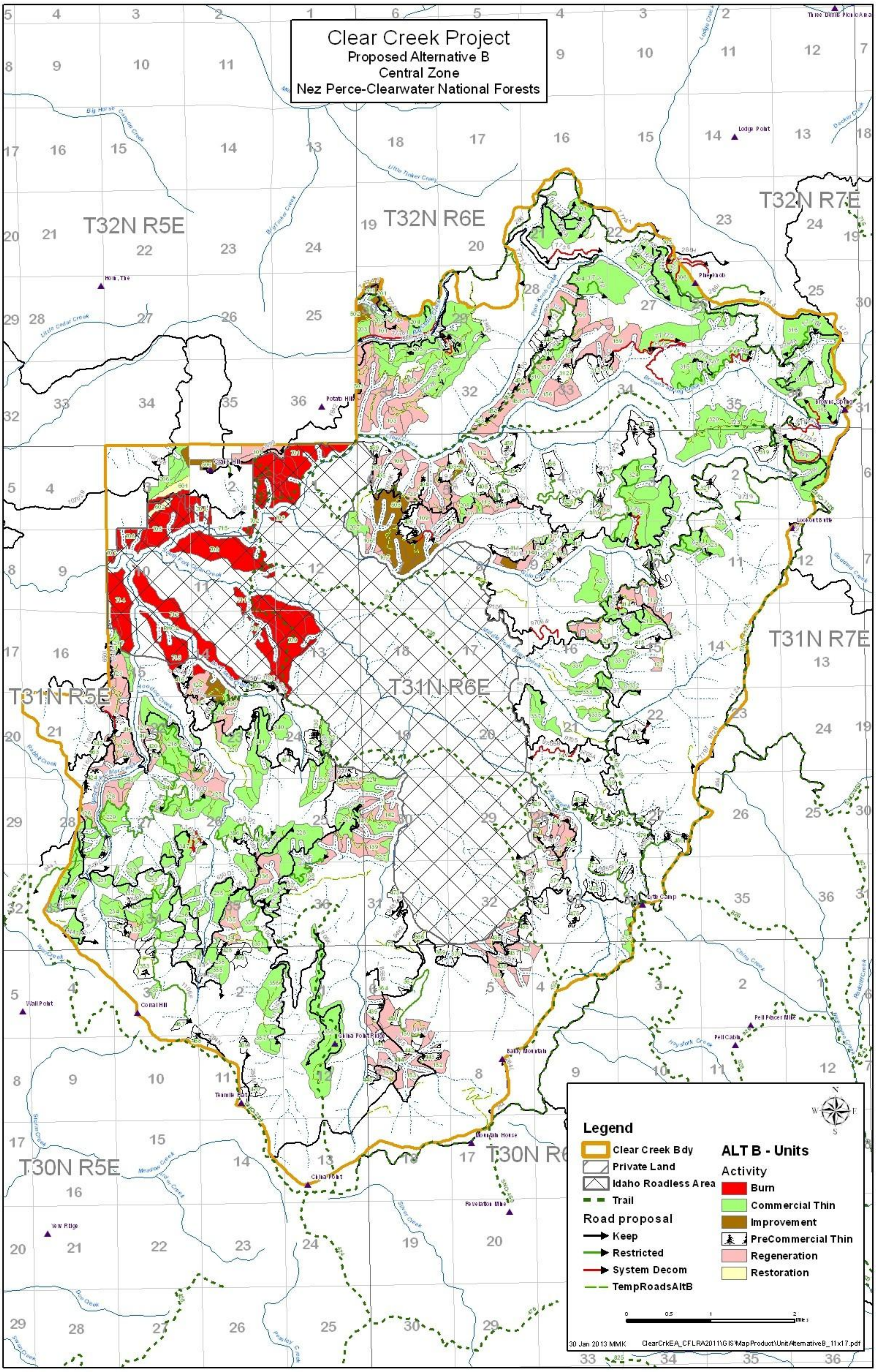
Zack, A. C.; P. Morgan; 1994. Fire History on the Idaho Panhandle National Forests. Moscow, Idaho: University of Idaho. 55 pages. Review Draft.

Zimmerman, E. A. and P. F. Wilbur. 2004. A Forest Divided. New Roxbury Land Trust newsletter.

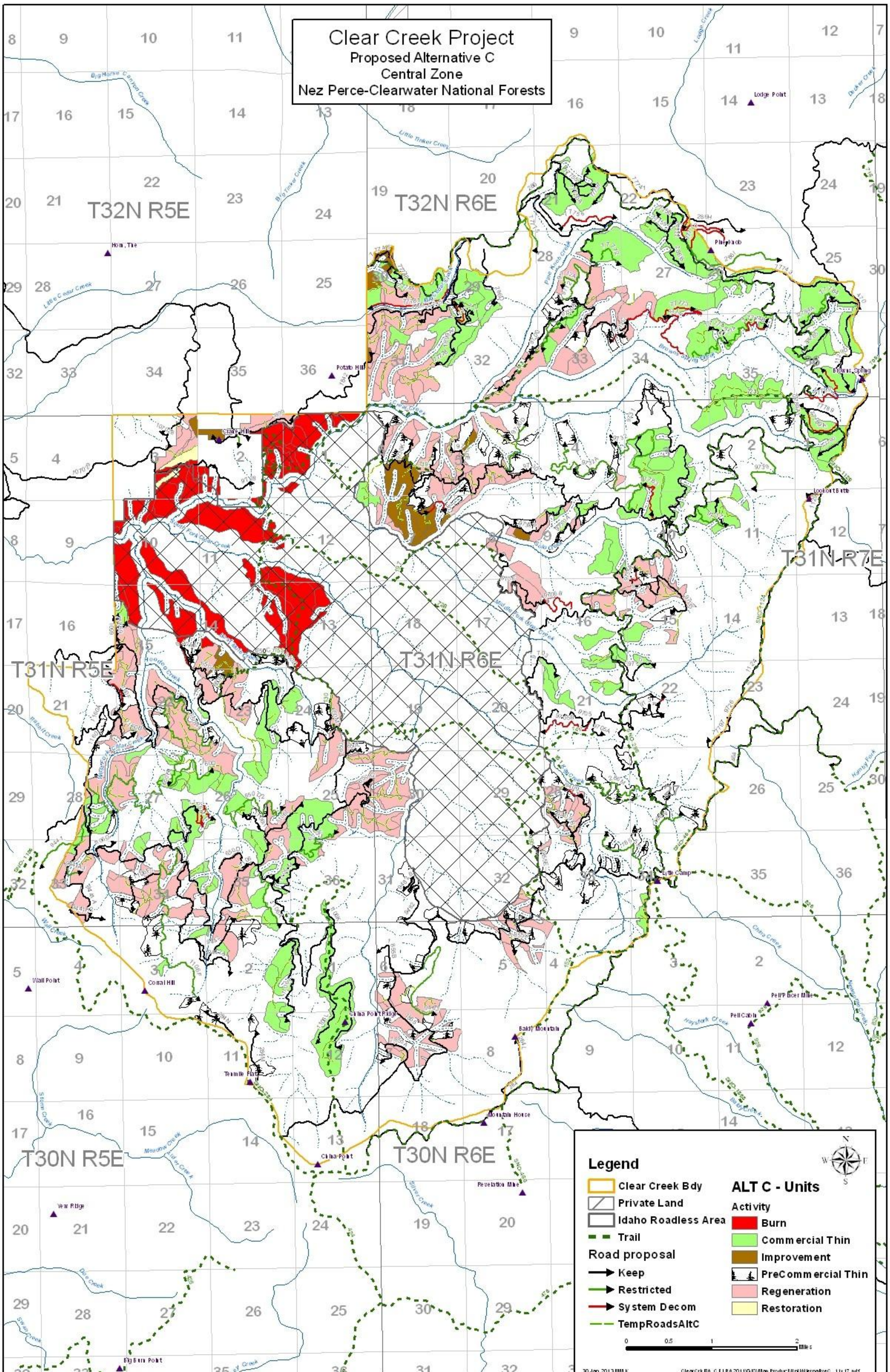
Chapter 7–Index

Appendix A--Maps

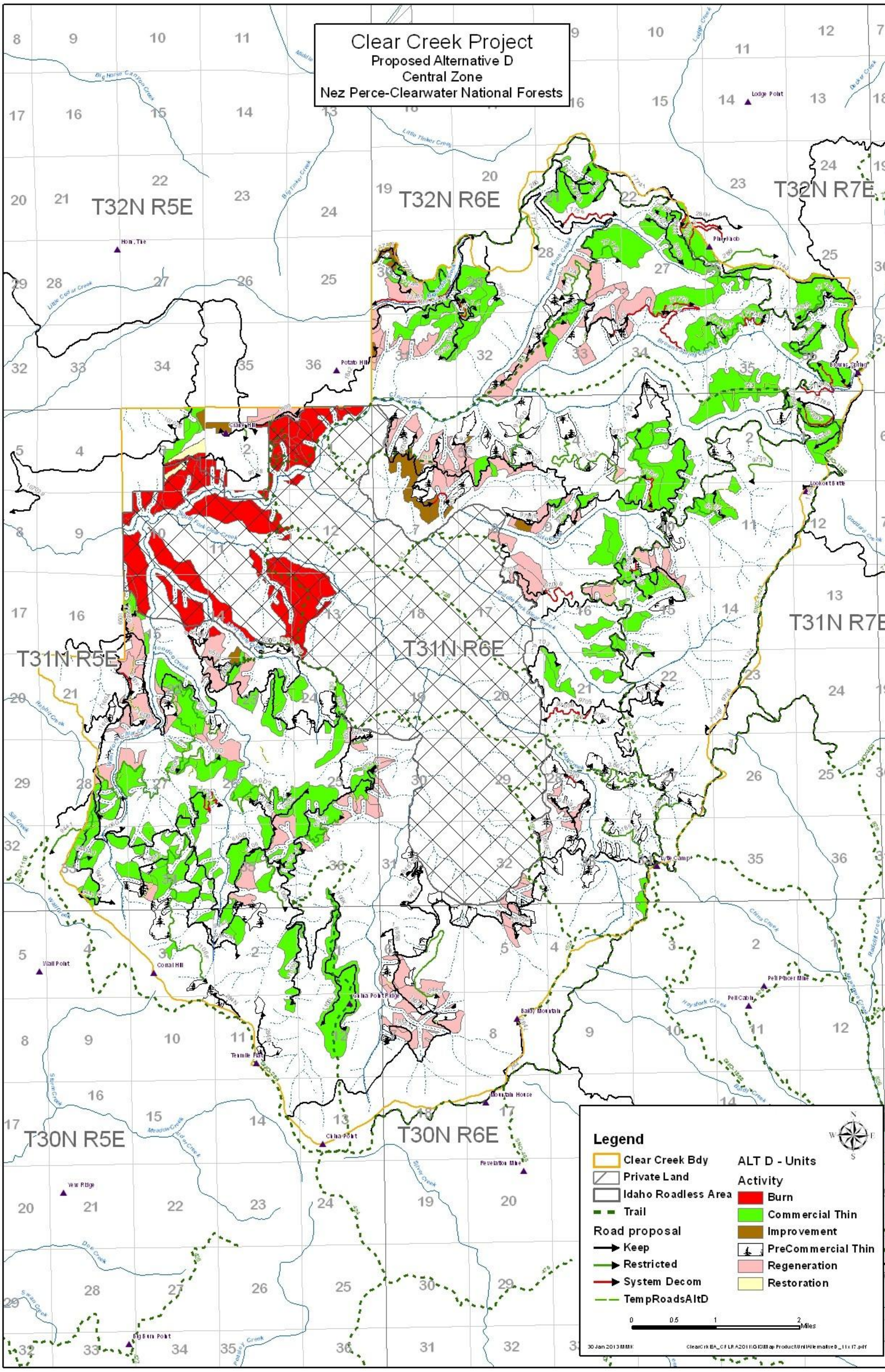
7.1 ALTERNATIVE B



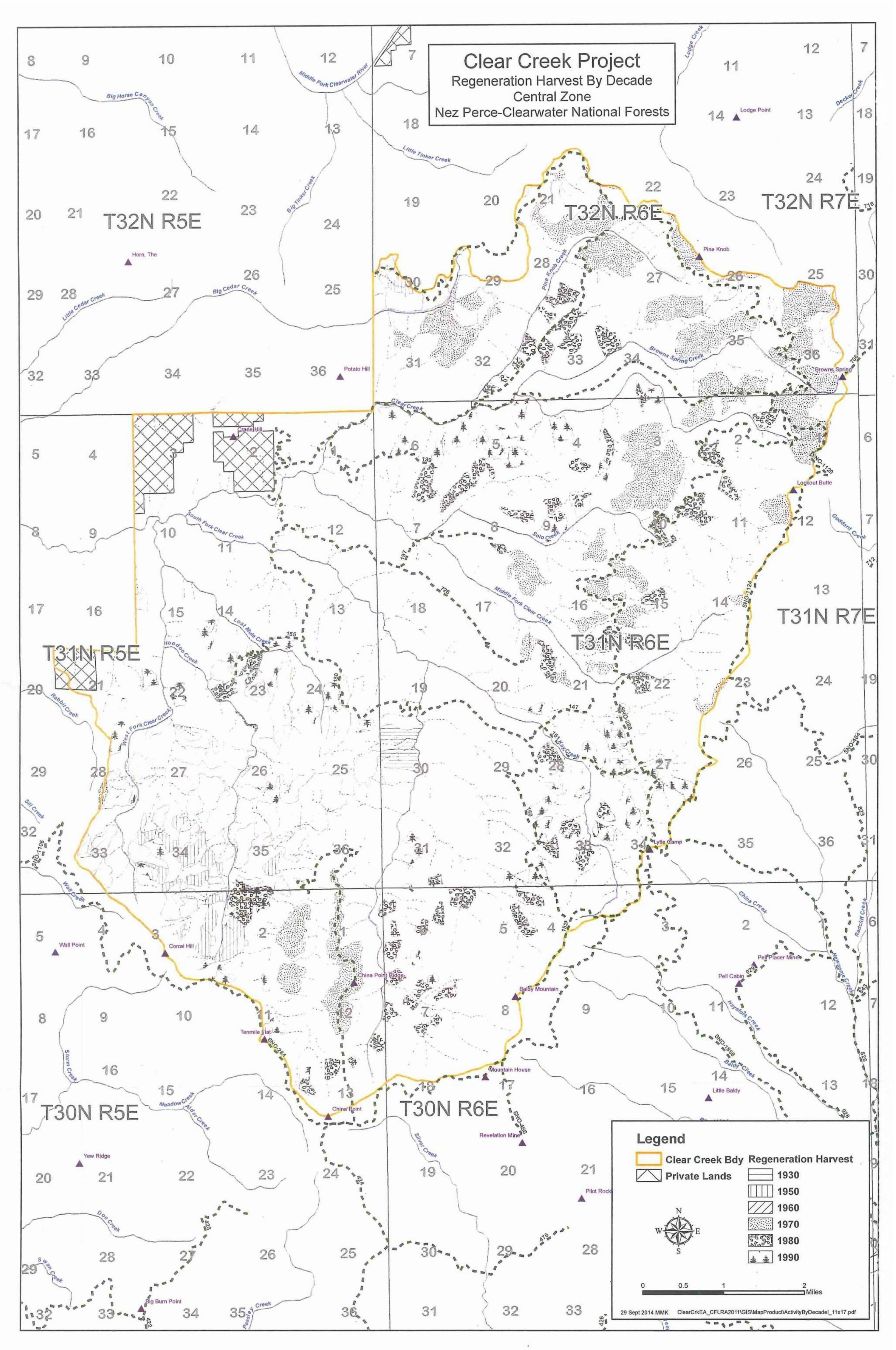
7.2 ALTERNATIVE C



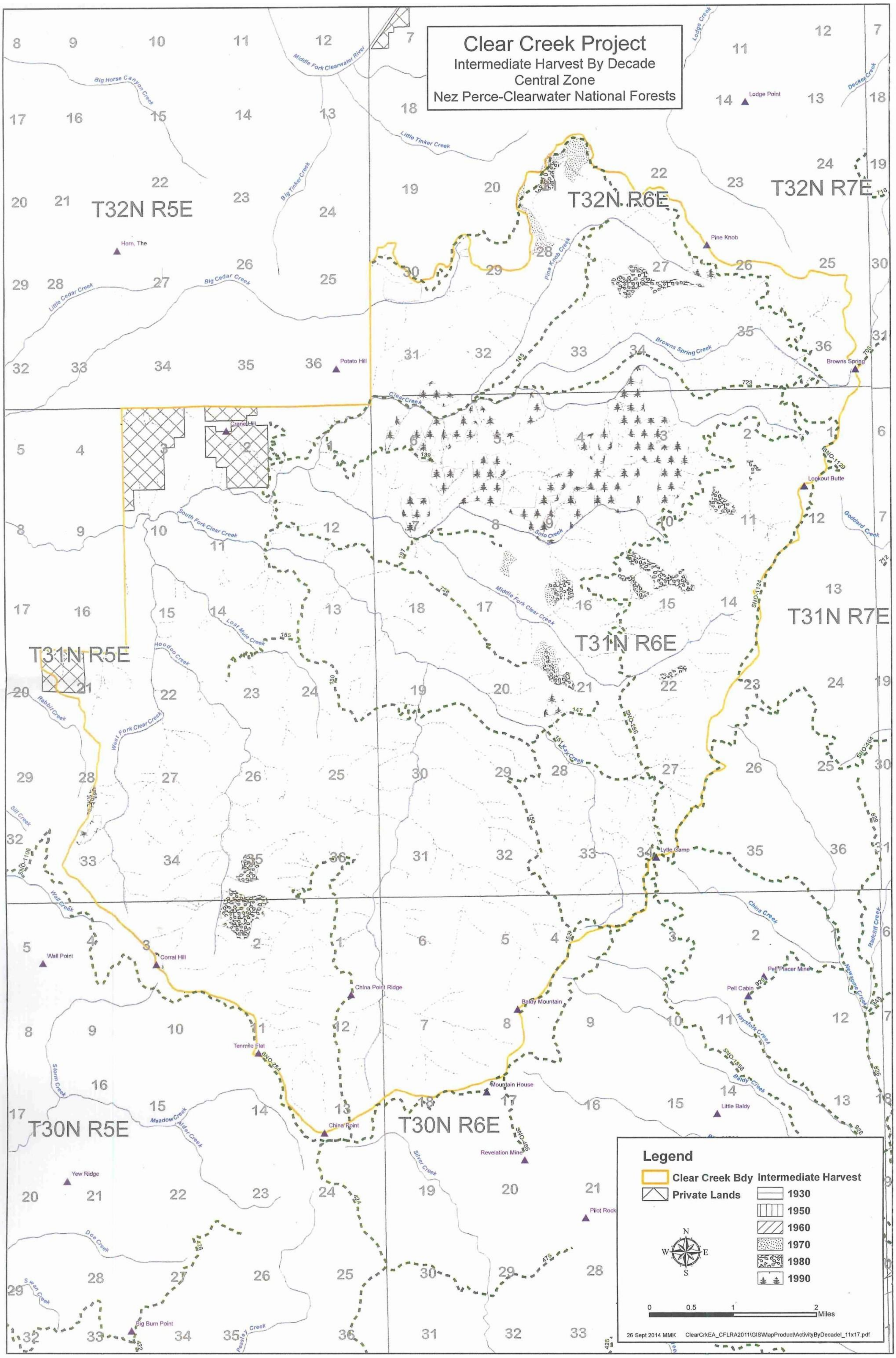
7.3 ALTERNATIVE D



7.4 Regeneration Harvest By Decade



7.5 Intermediate Harvest By Decade



7.6 Wildland User Interface (WUI) and Private Lands